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AUTOMOTIVE INDUSTRIES
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VOL. XLVI. NEW YORK—THURSDAY, MARCH 9, 1922 NO. 10

Market Analysis Essential to Used Car Sales

Knowledge of markets essential in solution of used car problem. New car market and used car market must be considered as a unit. Service of used car has important effect upon reputation of manufacturer. Dealer quotas must be established fairly.

By Harry Tipper

THE market for the automobile is affected by the entire consideration from the time the automobile is produced to the time when it reaches the junk pile. The size of the total car population in any locality is directly affected by the service rendered by the automobile and the valuation placed upon it at different stages in its usefulness.

So long as the possession of a car was the most important reason for the distribution of automobiles there was no great tendency to consider intimately the cost of its operation nor the depreciation in its value. As the car population has grown, however, until the car has become familiar and most of the new car buyers have previously owned vehicles of this kind, the cost of operation and the depreciation in value become more important. For the great majority of the people in this country the original investment in the price of a car is not so important as the amount of money which must be paid out each month in order to keep the car running. This relates not merely to the new car but also to the second-hand car and its operation.

The total volume for new cars is related to the life of the vehicle, and also to the second-hand valuations. It is obvious that the market for new cars of any particular manufacture is affected by the life of that particular car and the service it will perform in comparison with its valuation when it is transferred second-hand.

The manufacturer of automobiles, therefore, is intimately interested in the problem of valuing and disposing of used cars. The flow of new cars into the market must be regulated to agree with the flow of second-hand cars from buyer to buyer until they are junk. If there is any hesitation in the transfer of the vehicles at any point along the line, this will show itself in a lessened market for the new product, sooner or later, as a consequence.

It was stated in a previous article that the market conditions had not required a valuation on the part of the public as to the new car in relation to its service. Only lately has the buyer of a new car compared values with services for his particular purposes. The same thing has been true in the used car market. So long as the production was not sufficient to meet the demand, the used car sale was an individual matter between the buyer and the dealer. It represented no great comparative examination from the standpoint of service and it was not subject to the conditions of depreciation imposed by such valuation.

The general tendency must be for used cars from any given price group to come within a reasonable

comparative value—type, make and model considered. At present this is visible only as a tendency. The prices asked for used cars show an unstable market and a variation in valuation which does not aid the flow of the product, but which has a tendency rather to slow up the progress through which the automobile must complete its usefulness and reach the junk pile.

Every car that is being used by an individual owner, whether he has bought it new or second-hand, brings him into the business as a probable permanent customer for cars, or tends to drive him out of the business because of the difficulties imposed upon him by his first adventure. No matter what price may be paid for the used car, it is of no value unless it is in a condition to give service. No matter from whom it is bought, some of the difficulties that may be experienced reflect back upon the maker of the car and affect his market for the new product. It is obvious that the trade-in feature of the used car problem has affected the values and left the dealer in a position where he has paid more for such cars than it is possible to secure for them. It is obvious, in other words, that the trade-in has created a fictitious value in many cases for the used car and has slowed the progress of used car sales because of the loss entailed in moving them rapidly on to the market.

While this problem, of course, is a problem of the dealer, in the usual interpretation the manufacturer's market for new products is so intimately affected by the conditions operating in the used car field that it is necessary for him to advise with and co-operate with his dealers in the endeavor to put this proposition upon a more stable foundation, so that the market value can be determined within reasonable limits and the conditioning done on a reasonable basis.

Similar problems have been met in other fields in their history of development, notably in the typewriter field, where exchange has persisted for a great many years. In the course of its development the typewriter field has progressed to the point where a typewriter has a valuation in proportion to its age and model, without much regard to its particular condition. It is likely that the tendency in the automotive field will be to establish valuations more in accordance with the year and type of a car, the make, etc., and less in accordance with the particular conditions of the individual car taken in.

It is unlikely that trading will decrease to any great extent in the near future, but it is probable that such trading will have to be done on a basis of more accurate general valuations which will permit of the proper conditioning so that the used cars will be serviceable when they are bought. So long as a car is being run with the maker's mark on it, to be recognized as the production of a certain factory, the service of that car is important to the manufacturer because it is affecting the opinion of some car buyer and reflecting upon his possible new sales. In the history of its progress any individual car passes out of the control of the manufacturer or his dealer, although its influence upon his future sales continues until it is junk. As a consequence the manufacturer is closely concerned with the ability of the dealer in the automotive field, the repair shop and the service station to value a used car properly, to sell it in such a way as to permit conditioning and to give a reasonable amount of service.

The present acute condition in the used car field is due mainly to the anxiety of the dealers to sell new product without considering sufficiently the character of the trade and its effect upon the total cost of the business. The fact that the used car would be affected by the same causes which affect the sale of new cars does not appear to have been thoroughly understood, and the further fact that backing up of used car sales must affect the new car market was largely overlooked. The present acute problem will be solved partly by the necessities of the dealer and partly by the effort of alert manufacturers, through co-operation, aiding the dealers to relieve themselves of this difficulty. It is likely to remain a difficulty, however, for some time until the manufacturer and dealer thoroughly realize that the market for automobiles is inseparable and that the conditions affecting the market affect the whole market whether the product be used cars or new cars.

THE used car problem is acute. It will be solved partly by the necessities of the dealer, and partly by the effort of alert manufacturers through co-operation with the dealers.

It will remain a difficulty, however, until the manufacturer and dealer thoroughly realize that the market for cars cannot be divided; that the conditions affecting the market affect the whole market, whether the product be new or used cars.

The dealer cannot maintain his business in new cars unless he can see his way clear to dispose of the used car involved in the first transactions. Manufacturers must take this fact into account when planning production and establishing quotas.

It will be a difficulty until the manufacturers and dealers realize that the used cars must be conditioned before being sold if they are to exercise proper influence upon the future sales of new cars of similar make, and it will be a difficulty until the character of the service and the extent of the service in repairs, rebuilding and adjustment are sufficient to take care of the requirements of the field in this respect, so that the used cars may be bought upon a known basis of value and without the suspicion attaching to much of this business at the present time.

This part of the automobile market, although it has been discussed as a separate proposition, really affects the whole question of new car sales, the question of service, the repair shop equipment and car values. It should have a considerable place in the discussions leading up to the contract between the manufacturer and the dealer, and, in the course of time, it is likely that it should have some kind of a place in the contract itself where it relates to those cars affected by the contract conditions. The used car problem is a problem because of the following conditions:

1. The absence of established values so that no buyer is sure that he has received a proper value when he buys a used car.
2. Trades made without reference to the legitimate value of the car to be turned in and upon the individual condition of the car.
3. The sale of used cars without a proper amount of allowance for conditioning so that they would be in serviceable shape when they are bought.
4. The lack of proper facilities, sufficiently widespread in all parts of the country, for the general repairing and rebuilding of used cars so that the service can be extended to them whether they are in or out of production, until they no longer pay for repairs and are ready to be disposed of at the junk pile.

(*Continued on page* 550)

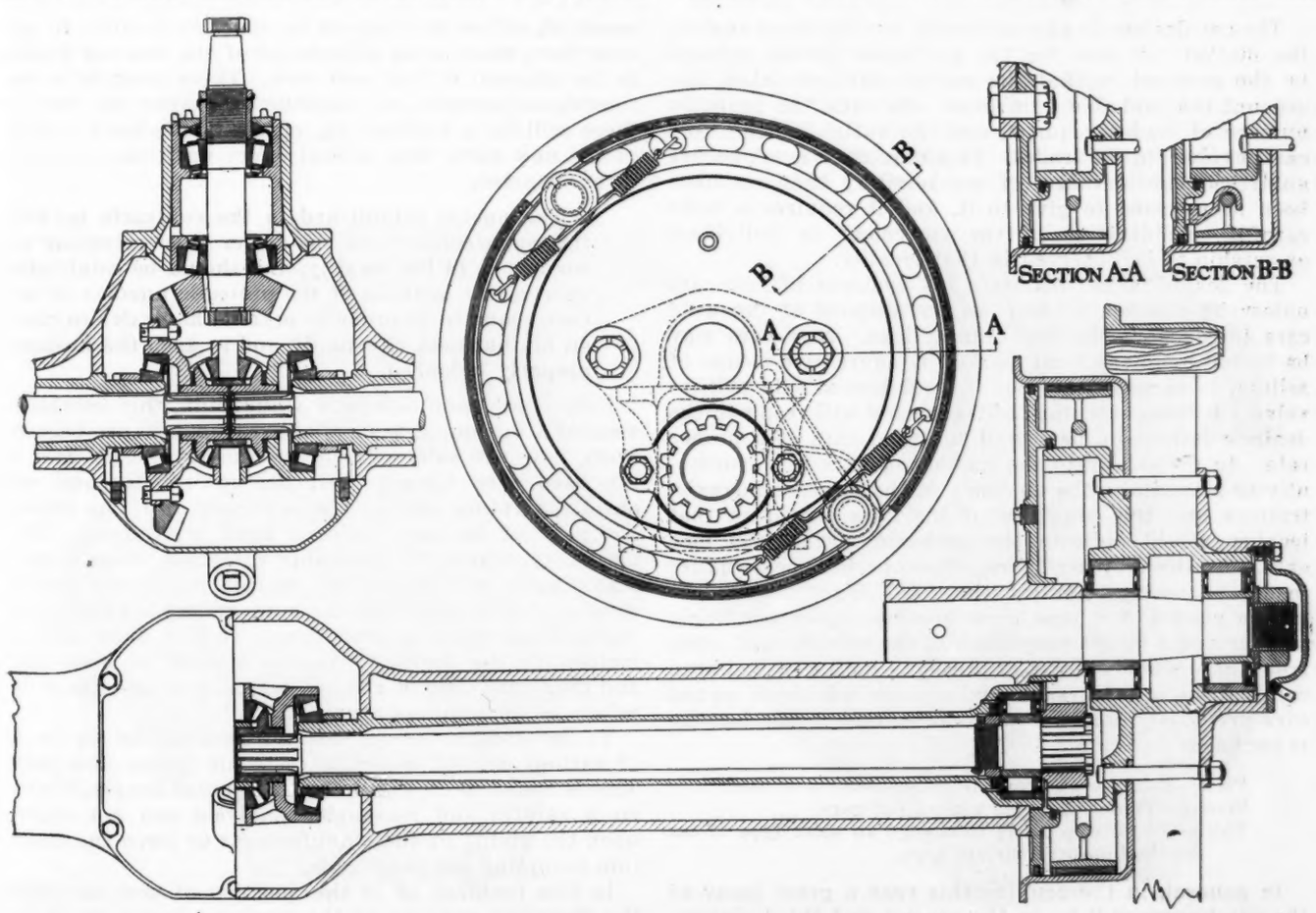
An Axle Designed Especially for Bus Applications

Is of internal gear type with differential and axle shaft below instead of in front of wheel spindle. It is thus possible to mount the chassis frame several inches lower than with conventional types. The design is quite simple, affords good accessibility and incorporates a number of refinements.

By Herbert Chase

TWO sizes of internal gear axles intended primarily for use on bus chassis have recently been designed by the Britton Axle Co. In general design the axles are similar to Britton truck axles, but in this case the live axle shaft is placed directly under instead of in front of the wheel spindle. By the use of this type of construction it is possible to make the frame of the chassis several inches lower than is otherwise possible, a considerable advantage so far as bus construction is concerned. The top of the differential case is slightly over 18 in. from the ground and the outside diameter of the case is only 10⅝ in. when 34-in. tires are employed, while the spring seats, which do not require the use of separate chairs, are 1⅛ in. lower than the axis of the wheel. The ground clearance under differential is 7-7/16 in. In addition to these features the axles incorporate certain refinements in design which are readily seen by reference to the accompanying cut.

The differential is carried on the inner ends of a tubular member which surrounds the axle shaft and projects into the central differential chamber. These ends are threaded to receive collars which permit side adjustment and hold the differential against motion parallel to the axle. The collars are locked in turn by pins which project from the inner wall of the case cover into slots cut in the collar. The cover cannot be put in position without locking the collars. The tubular members are recessed to carry the pinion bearing at their outer end,



Sectional views of the new Britton bus axle

and are held in place by two bolts which when removed permit the tubes to be slipped axially outward after which the differential can be withdrawn.

The live axle or jackshaft is of high-grade alloy steel and is splined at each end. The arrangement is such that the pinion is very close to the bearing.

The brake anchorage plate is recessed on its outer circumference to receive a packing intended to prevent water and dirt from entering the brake drum, and carries a second packing set on an angle and arranged to retain oil within the polished tapered surface of the internal gear against which it bears. The latter is of 3½ per cent nickel steel rolled or spun into shape from a flat integral piece. The teeth only are carbonized. On the model 30 axle there are 48 teeth of 4/5 pitch, 20 deg. pressure angle and 1½-in. face. The gear is secured to the wheel hubs by twelve ½-in. alloy steel bolts which pass through the gear flange, hub flanges, brake drum and wheel. This construction permits replacement of the gear more easily than when the latter is riveted to the hub flange.

The pinion, which is also of carbonized alloy steel, is held in place by a threaded collar which is screwed onto the axle shaft and turns against an oil-retaining washer. The latter, together with the washer referred to above seal the gear chamber, which is said to remain tight when containing three pints of thin differential grease which lubricates the internal gear and the three bearings of the wheel and pinion. The taper roller bearings used on the bevel pinion shaft are mounted in an adjusting cage which can be moved axially without disturbing the bearings, but the latter can be adjusted by turning the integral hex sleeve and nut mounted on the shaft after which these are positively locked in place by a tongued washer between the two. This construction avoids the use of two nuts and a plain spacing sleeve which, if the packing is made oil tight, is apt to hold the sleeve stationary and allow the nuts to wear and thereby destroy the bearing adjustment.

The bevel gears are of 3½ per cent nickel steel, with 4-pitch carbonized teeth, 30 deg. lead angle and 1¼-in. face. The ring gear has 37 teeth and the pinions from 13 to 22 teeth, giving total reductions, including that in the internal gear of 9.76 to 5.77 to 1. Spring centers on the model 30 axle are 42½ to 45¼ in. The tread is 70 in. and the load capacity 8000 lb. One set of brakes is provided. These are of the internal expanding type and are easily removed by simply disconnecting the springs seen in the drawing.

The high-section modulus of the box-shape section of the axle is said to give it unusual rigidity with moderate weight. The makers claim that the axle contains a smaller number of both manufactured and standard (purchased) parts than any other similar axle on the market. With one exception right and left hand parts are the same, and the axle is so designed that it can be produced with the same tool equipment used on Britton truck axles.

Market Analysis Essential to Used Car Sales

(*Continued from page* 548)

The car dealers in any particular locality must analyze the market for cars for the particular period covered by the contract so that the market analysis takes into account the probable number of new cars, the probable number of trades required and the outlet for the used cars involved in the trades. This requires a much keener analytical consideration of the territory than we have been accustomed to give to it, and it requires a more careful consideration of the movement in individual ownership to be observed in that locality.

The dealer cannot maintain his business in new cars unless he can see a clear way to dispose of the used cars involved in the first transactions. New cars may be forced upon the local market by aggressive means of selling, to some extent; but this additional sale will involve a larger percentage of trades and will result in the dealer's failure to dispose of his used cars at a proper rate. In proportion to the number of cars in a community or a territory, the tendency of the increase in registrations and the condition of the cars owned in that locality would indicate the probable market for new cars. As the increase in registrations becomes smaller in its percentage against the total registrations, the virgin market for new cars becomes correspondingly smaller and a larger proportion of the market must come from those who own cars at present. Both new and used cars will be sold increasingly to people who have owned cars previously, and the total car market in the locality is confined:

First—To those who come in as new buyers of cars.
Second—Those who replace worn out cars.
Third—Those who desire to change an older type of car for the improved current type.

In general, in the country this year a great many of the car buyers will be in the second and third classes, and in each case of this kind the used car must be disposed of, either by trade or by individual sale. In any case there must be an adjustment of the new car buying to the disposal of the used cars. There must be a reasonable adjustment of valuations between the two or there will be a backing up, either in the used cars or in the new cars, with a final effect upon the manufacturer's market.

The quotas established in the contracts between the manufacturer and the dealer must recognize the conditions in the locality, and should be established upon a fair analysis of the probable number of new cars required in order to permit the dealer to carry on his business effectually and to keep the business properly balanced.

From the manufacturer's standpoint, this establishment of a fair quota basis is of great importance because every new car sold without the corresponding flow of the used cars toward their destination as junk will obviate a future sale of the new cars until the choked condition of the used cars on hand is removed. This means, of course, a reasonable valuation, upon a more stable basis, of the used car so that it will not involve greater service value than the new product nor materially less service value in proportion. It is a more difficult matter for the dealer to finance himself on used cars, and they must flow in and out regularly if he is to maintain a sound business condition.

To the manufacturer a stock of used cars in the hands of various dealers is a menace to his future new sales. This is bound to happen unless the quotas are established on a careful and reasonable analysis and not merely upon the ability of the manufacturer to force the dealer into accepting the conditions.

In this problem, as in the question of new car sales, the thorough analysis of the territory looms up in importance.

Weidely Producing a New Engine

Is six-cylinder overhead valve type, intended for light and medium weight cars and is built in two sizes having respectively 3¼ and 3⅜ in. bore. Force-feed lubrication is used throughout and the crankcase and cylinders are cast in block. Is said to develop 1 h.p. per 3.95 cu. in. displacement.

By J. Edward Schipper

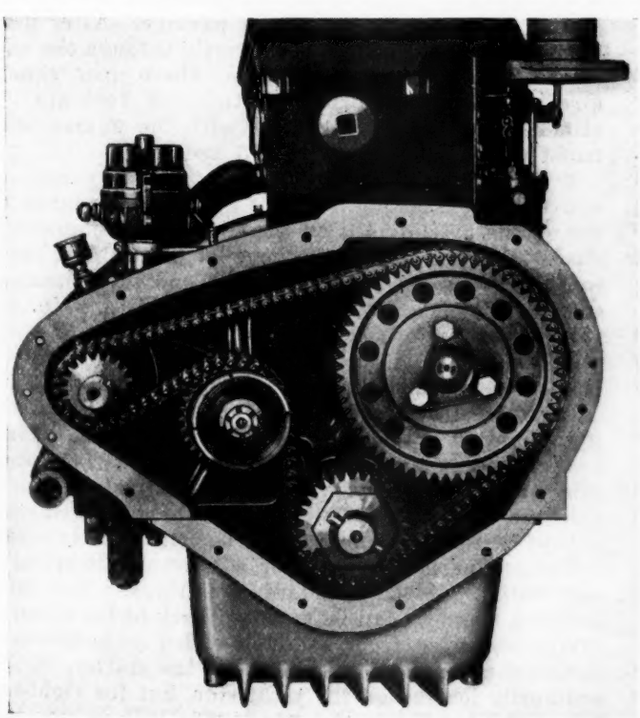
A NEW six-cylinder engine for light and medium-weight passenger cars has been brought out by the Weidely Motors Co. It is to be marketed under the name of Forty Point Bulldog and will be immediately put in production.

The new unit is an overhead-valve type, 3¼ x 5 in., developing 63 hp. at 3000 r.p.m. With a displacement of 248.9 cu. in., this is 1 hp. per 3.95 cu. in. displacement. The unit is also provided in 3⅜ x 5-in. size and is furnished with a No. 3 bell-housing for a unit power plant. The six cylinders, together with the crankcase, are a single casting, a detachable head and an aluminum underpan completing the engine structure.

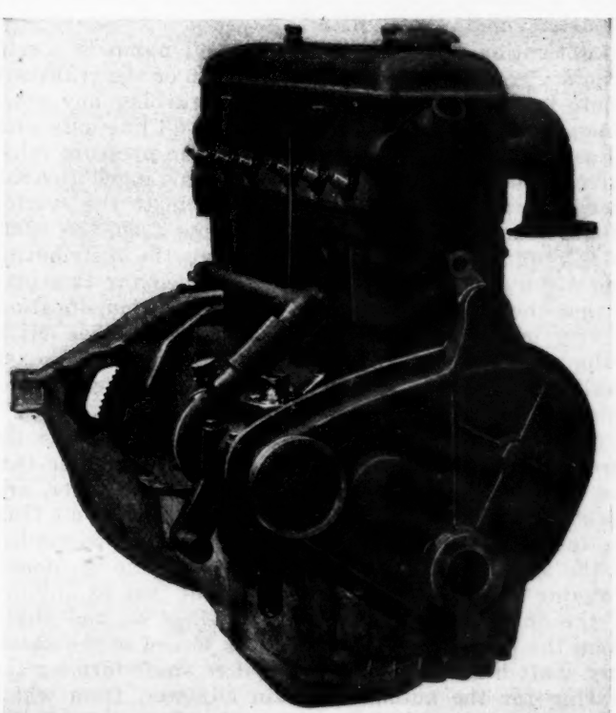
It is claimed that high torque is developed throughout the entire range of speed. The compression is 77 lb. absolute at 200 r.p.m. with wide-open throttle. Considerable attention has been given to balancing of the engine; to reduce vibration to a minimum a large diameter crankshaft is used, and reciprocating parts are kept light and equalized. The pistons, including the wrist pin and three rings, weigh 1 lb. 8.7 oz. each. With the connecting rod the assembly weighs 4 lb. 3.7 oz., and the piston alone, without wrist pins, 1 lb. 2.3 oz. The clearance of the cast-iron piston ranges from 0.002 in. to 0.003. The pistons are dome topped and are 3⅝ in. in length. The piston pin is fastened in the piston, the bearing being in the upper end of the rod. S. A. E. steel No. 1020 is used for the piston pin, which is hardened and ground. The pins are 1 in. in diameter and weigh 3.10 oz. The piston castings are made with finish allowance for grinding only, and it is claimed that this results in a much harder and closer grained unit than is secured when more material is left for removal in machining. The piston rings are a deep, narrow type.

The crankshaft has three bearings and is forged of No. 1045 S. A. E. steel; it is 2⅜ in. in diameter and weighs 79 lb. The main bearings are of the bronze-back, babbitt-lined type. The front bearing is 2⅜ in. in diameter by 2¼ in. in length, while the other two bearings are 2⅜ by 3 in. End thrust is taken up on the front bearing. The connecting rods are I-section drop forgings, of 11 in. center-to-center length, and weigh 4 lb. 3.7 oz.

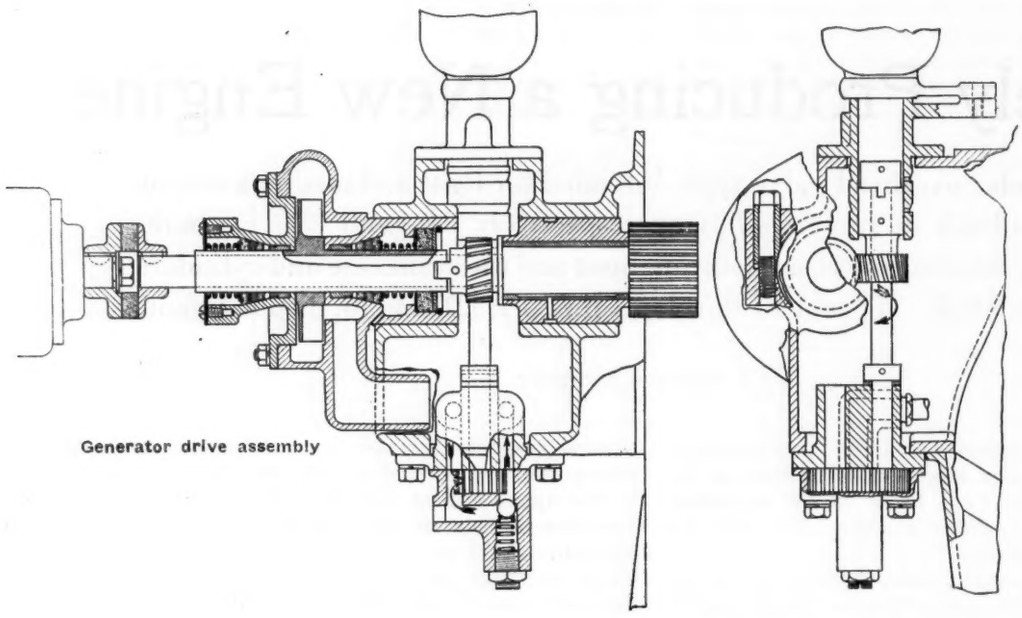
The timing drive is by chain. This is a Link-Belt unit having an automatic adjuster which takes care of the chain stretch. The take-up is on the flat side of the chain, as shown in the illustration herewith. The camshaft is drop forged from S. A. E. No. 1020 steel and is



Front view of engine showing automatic take-up acting on reverse side of timing chain



Three-quarter front view of new Weidely six-cylinder engine, designed for passenger car application



Generator drive assembly

1 3/16 in. in diameter. It is mounted in three bronze bearings of the following dimensions (front to rear): 2⅜ x 2⅛ in., 1¾ x 1¾ in. and 1⅝ x 1⅜ in.

To secure a quiet valve mechanism, the rocker arm, push rod and tappet are held light in weight. The normal clearance between the rocker arm tips and the valve stems, when the valve is seated, is 0.004 in. The cam is so laid out that for 30 deg. before the point of valve opening the clearance is very gradually taken up, until the tip of the rocker arm is just in contact with the valve stem at the point where the valve begins to open. From this point on the valve opening is rapid. The closing incline of the cam is the reverse of the opening incline.

The intake valves are of chrome-nickel steel and the exhaust valves of Silchrome steel. They have a 1⅝-in. clear diameter, 5/32-in. head thickness, 5/16-in. stem diameter and 11/32-in. lift.

Lubrication is by pressure. The oil pump is a self-priming, gear type mounted on the side of the crankcase where it can be removed without disturbing any other units. It is arranged to pump into the oil line only such oil as is required at a set pressure. The pressure relief valve is located in the pump and so arranged that all excess oil is by-passed within the pump to the suction side, so that only so much oil is taken from the sump as is required for circulation through the distributing line at any time. An advantage claimed for this plan is that the breakdown of the oil, due to emulsification, is very much reduced. It is claimed that when oil is whipped around at high velocity and forced through small openings under high pressure it is broken up and quickly loses its lubricating qualities.

The oil is forced through a distributing tube to the three main bearings. The crankshaft is drilled so that the oil can pass freely from one end to the other, and the connecting rod bearings are supplied with oil from the inside of the shaft. This eliminates the possibility of the system being made inoperative by the accidental plugging of one of the lines, or even of two, as any one of the three will feed all the bearings on the shaft. From the front main bearings oil is forced to the accessory shaft bearings and to the drilled shaft forming the bearing for the automatic chain adjuster, from which latter shaft the oil finds its way to the chain proper.

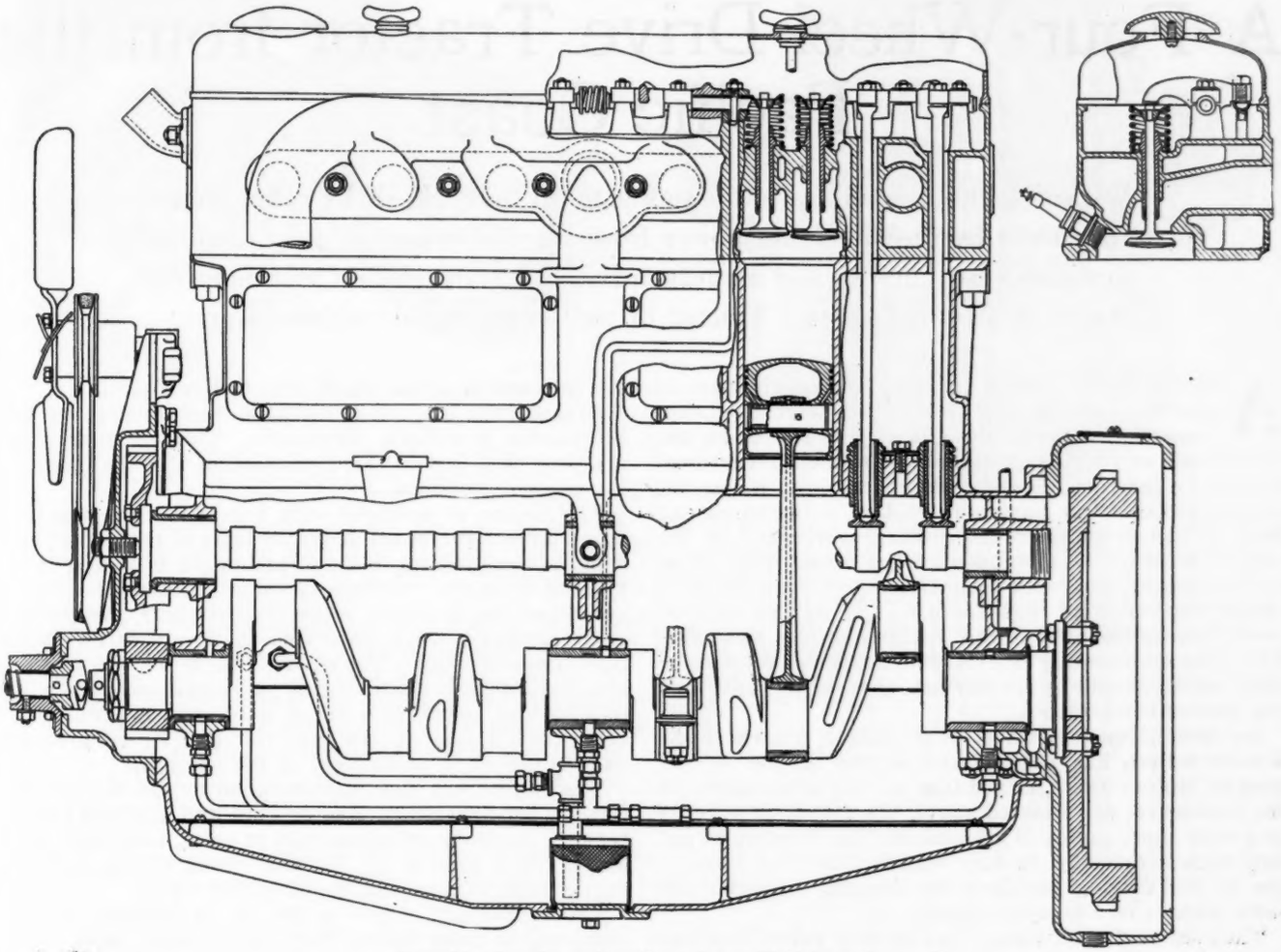
By means of another line and holes drilled through webs in the upper part of the crankcase, oil is fed intermittently under pressure to the camshaft bearing and to the inside of the follow rocker arm shaft, from which it is forced to the rocker arm bearings and, through a hole in the rocker arm, to the top of the push rod, which is cupped to hold this oil. It then travels down the push rod to the valve tappet, lubricating the ball on the bottom of the push rod. The valve tappet is hollow and is cross-drilled to allow the overflow oil to escape, lubricating the valve tappet guide as it returns to the crankcase. The piston and cylinder walls are lubricated by oil thrown off by the connecting rods. On the down stroke of the piston the top edge of the oil relief groove scrapes the excess oil from the cylinder walls into the relief, from which it is carried to the piston pin. With this system, it is claimed, the entire overhead-valve action is working on a cushion of oil.

The major part of the inlet manifold is cast inside the cylinder head and is water-jacketed. That portion which is outside the head is integral with the exhaust manifold and thus acts as a vaporizer for the heavy fuel; it is entirely surrounded by the exhaust jacket, and any liquid fuel which may be creeping along the walls of the intake manifold stands a good chance of being vaporized there. The wall in the heated portion of the intake manifold is pocketed, so the liquid gasoline will be held until it is vaporized. The converter, as the exhaust-heated portion of the intake manifold is called, is comparatively short, so that the gas is carried through it quickly and the heat cannot penetrate the whole air stream in the short time of its passage. After leaving the converter, the gas passes directly through the middle of the head to the opposite side, where upon changing direction any unvaporized particles of fuel are again attacked by coming in contact with the unjacketed exhaust ports of cylinders Nos. 3 and 4.

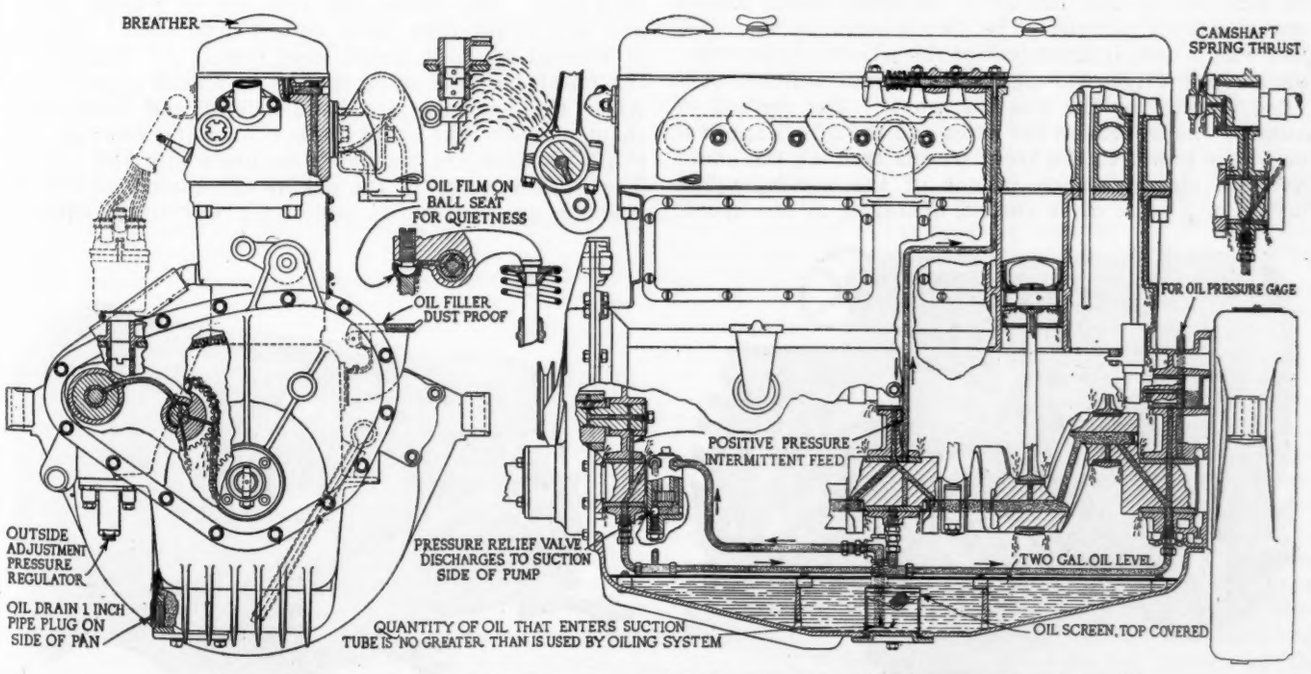
Water circulation is by a centrifugal pump. The entire pump assembly is a unit which can be taken from the engine by sliding it off the rear end of the accessory shaft. On each side of the impeller is a babbitt bushing to keep the shaft central, and beyond this bushing on each end is placed the packing. There is a ⅜-in. water space between adjacent cylinder barrels. The spark plug bosses are entirely surrounded by water, which is claimed to be unusual in overhead-valve engines.

An interesting feature affecting ease of repairs is that if the oil pan is taken off, the piston and connecting rod assemblies can be removed from the bottom of the engine. The oil pressure relief valve can be adjusted from outside the engine. The oil drain plug is located on the side of the oil pan where it can be conveniently reached.

The engine is arranged for a two-unit electrical system with S. A. E. standard mountings. For foreign orders a magneto can be mounted back of the generator, taking its drive from a double-ended generator shaft. A barrel mounting is provided for the starter, which is ordinarily located on the right side, but for right-hand-drive cars for the foreign trade it is just as convenient to locate it on the left side, as provision has been made for both locations. The weight of the engine without accessories is 575 lb.



Assembly view, in part section, of new Weidely engine


BREATHER
OIL FILM ON BALL SEAT FOR QUIETNESS
OIL FILLER DUST PROOF
CAMSHAFT SPRING THRUST
FOR OIL PRESSURE GAGE
POSITIVE PRESSURE INTERMITTENT FEED
OUTSIDE ADJUSTMENT PRESSURE REGULATOR
OIL DRAIN 1 INCH PIPE PLUG ON SIDE OF PAN
PRESSURE RELIEF VALVE DISCHARGES TO SUCTION SIDE OF PUMP
TWO GAL. OIL LEVEL
QUANTITY OF OIL THAT ENTERS SUCTION TUBE IS NO GREATER THAN IS USED BY OILING SYSTEM
OIL SCREEN, TOP COVERED

Oiling diagram, showing lubrication of crankshaft, overhead valve system and other units

A Four-Wheel Drive Tractor from the Pacific Coast

Wizard 4-Pull tractor transmits power to all four wheels by roller chains and steers by disconnecting power from wheels on one side. Engine of company's own design and manufacture. All transmission members enclosed in oil-proof cases. Tractor of unit construction without frame.

AMPLE traction being an important requirement in tractor work, it is not to be wondered at that a number of tractor designers have turned to the four-wheel drive. As compared with the conventional design, driven through the rear wheels only, it has the advantages that the maximum traction is increased and that all danger of the tractor being overturned by the torque reaction is eliminated. The usual four-wheel drive construction with live front and rear axles is rather expensive to manufacture, and as low cost of production is essential in the tractor industry, designers have been endeavoring to evolve new types of four-wheel drive which should be simpler and cheaper to build than the conventional form.

An interesting four-wheel drive tractor, known as the Wizard 4-Pull, has been placed on the market by the Kroyer Motors Co. In addition to the advantages of the four-wheel drive stated above, the ability of turning in a very short radius is claimed for this tractor, as not only does it drive by all four wheels, but it also makes use of the driving members for steering in much the same manner as a creeper tractor.

The four cast steel wheels run on 5-in. roller bearings mounted on stationary axles. The final drive is by roller chains direct from the transmission to the front wheels. The rear wheels are driven by separate roller chains from the front wheels. The two wheels on one side operate as a unit, independent of the wheels on the other side, and are driven through multiple-disk clutches controlled directly by the steering wheel. The method of mounting the wheels on the axles and the direct application of the power to the front wheels through the chain drive are clearly shown in one of the accompanying illustrations. The drive chains, operating at low speed, are inclosed in a dust-proof case and run in oil.

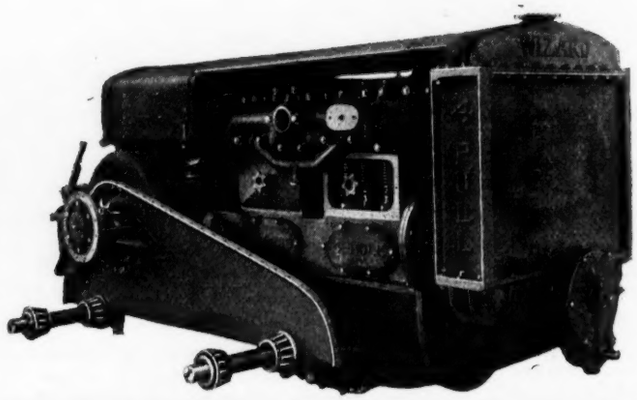
Grease cups and oil holes have been eliminated and lubrication is entirely automatic. Two oil filler plugs are provided, one on the transmission and the other on the engine crankcase.

The engine is equipped with a gear-driven, gear-type oil pump that forces oil under pressure to the crankshaft, camshaft, connecting rod and piston pin bearings. Surplus oil from the bearings is showered over the timing gears and fan bearings, while the cylinders, pistons and valve mechanism are lubricated by the oil thrown from the connecting rods. The master clutch, the two steering clutches and the transmission gears and bearings work in a bath of heavy oil. An oil level gage is provided to show the oil level in the reservoir and an oil pressure gage is placed in plain sight of the operator.

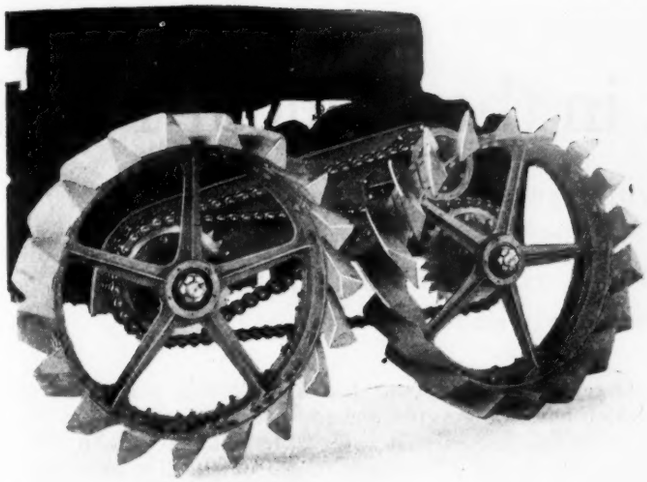
The engine was specially designed by the Kroyer Motors Co. for heavy-duty tractor work and is of the L-head type. It has four cylinders, cast in pairs, with removable heads. The bore is 5¼ in., the stroke 6½ in. and the engine runs at a normal speed of 850 r.p.m.

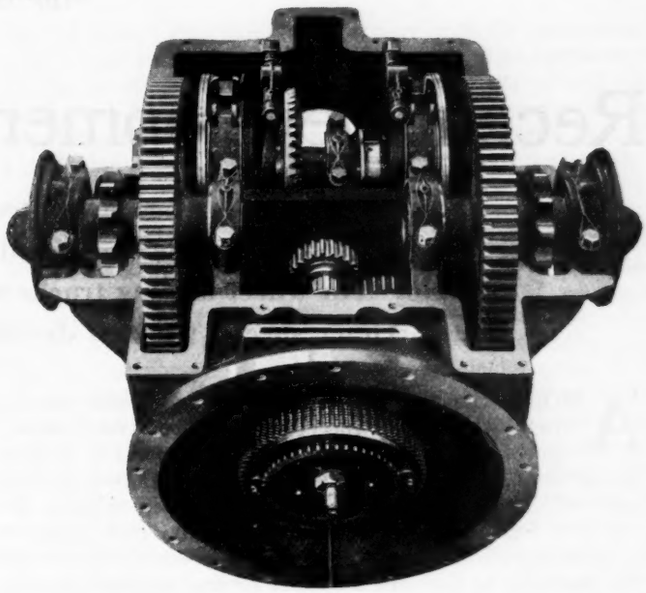
The crankshaft, which is 2¾ in. in diameter on the bearings, is drop-forged from open-hearth steel, heat-treated, and is supported by three main bearings, 4, 4 and 5 in. in length. The connecting rod bearings are 3¼ in. long each. The connecting rods are of I-beam section and are drop-forged from open-hearth steel. The cap is secured by four nickel steel bolts. All bearings on the crankshaft are hand-spotted to obtain a perfect fit. After the bearings are hand-spotted and fastened to their supports, the crankshaft, connecting rod and camshaft bearings are reamed to accurate size and centers. The working parts of the engine are assembled and the bearings are then run in cold on a power-driven running-

Wizard 4-Pull tractor



Side view of tractor with wheels removed, showing axle ends, chain sprocket pinion and engine details





(Above)—Chain drive to front and rear wheels
(Right)—Clutch and transmission with cover removed

in stand. All bearings are grooved, but not cut for oil clearance. The 0.002-in. allowance in reaming and the method of cutting the grooves is claimed to insure a film of oil on the bearing surface.

The camshaft is drop-forged and is supported by three bearings of different diameters, which allows the shaft to be removed from the front end of the engines.

The water space around the cylinders is said to be much larger than in the usual practice, and special provision is made for the circulation of water around the valves and spark plugs. The radiator is of the tubular type and water is circulated by a pump. The fan is gear driven.

The engine is equipped with a Bosch high-tension magneto with automatic impulse starting coupling. Provision has been made for dust-proofing the impulse starting coupling. The magneto is dust- and water-proof. The spark control and throttle are operated by one lever which is located within easy reach of the driver.

The engine is equipped with a flyball throttling governor acting on a butterfly valve in the inlet manifold. The governor is fully inclosed, yet it is readily accessible and can be quickly adjusted. The normal operating speed is 850 r.p.m.

Cranking of this large engine is said to be easily accomplished by means of a four-to-one geared starter on the front end of the tractor, which is clearly shown in the accompanying illustration. This starter disconnects automatically as soon as the engine starts, eliminating danger of back-kicks.

The engine is regularly equipped to burn either gasoline or distillate, but special equipment is provided to burn kerosene. Sufficient fuel-carrying capacity is provided for a day's work.

The transmission is of the selective, sliding-gear type. Gears and sprockets are forged from chrome nickel steel and are machine cut and oil tempered. The shafts are of nickel steel and are supported on large ball and roller bearings. All work is done on a direct-drive speed at 2½ m.p.h. A geared speed of 4 m.p.h. is provided for transportation and commercial work. The reverse speed is 2 m.p.h. Both the flywheel clutch and the steering clutches are of the multiple-disk type, being composed of bronze and steel plates.

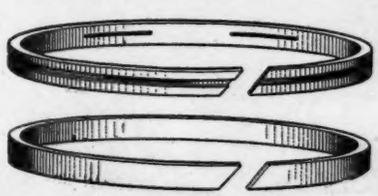
The belt power drive is a unit in itself and is attached to the rear of the tractor. It can be readily removed or attached by removing a cover plate and putting the belt drive unit in its place. The drive is direct from the crankshaft, through the flywheel clutch and through a spline coupling. The belt pulley runs parallel with the tractor and turns at the same speed as the engine crankshaft. Roller bearings are used on the pulley shaft.

The tractor is of unit construction without frame. Its normal drawbar pull is 3000 lb. at a speed of 2½ m.p.h. With standard leader shoes the machine is 66 in. in width, 110 in. in length and 67 in. in height. For vineyard use leader shoes are provided, giving a width of 58 in., while for peat or swamp land shoes of greater width are provided, giving a tractor a width of 72 in. For a machine of its drawbar capacity the Wizard is of very compact design and comparatively light, weighing only 6800 lb.

A New Design of Piston Ring

PISTON rings in sets of three, of which two are to hold the compression while the third is designed to distribute or regulate the oil, are being marketed by the Indiana Piston Ring Co. The compression rings are of the usual form with scarfed joint, the process of manufacture being such as to assure accuracy to within 0.010 in. when tested in a flexible gage and the shutting out of all light when tested in a round gage. These rings are also said to be entirely free from edge warp.

The oil-regulating ring is machined with a groove around its circumference midway between its edges. This groove acts as an oil reservoir. Any surplus oil collects in the groove and is drained into the piston ring groove through slots through the ring which are about equally spaced over its circumference. From the ring groove the oil can be drained back to the crankcase through holes drilled through the piston wall at the bottom of the ring groove in the usual way.



Rings manufactured by the Indiana Piston Ring Co.

Recent Development in the Railcar Field

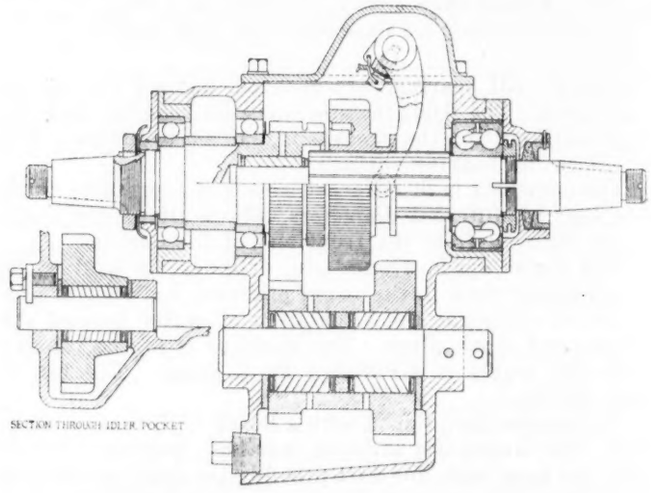
Both cars here described are fitted with regular and special reverse gearsets which make possible high speed operation in either direction, and both employ four-wheel leading trucks with live axles running in plain bearings. Other special features described include cushion wheel.

AMONG the truck manufacturers who are turning their attention to the construction of truck chassis especially equipped for use on rails is the Indiana Truck Corp., which has modified its 2½-ton chassis for this purpose. This chassis is equipped with a four-cylinder 4⅜ x 5½ in. engine which drives through a dry plate clutch to a conventional four-speed gearset. Between the latter and the rear axle is mounted a special reverse gearset made by the Warner Gear Co. and shown in the accompanying cut. The main shaft of this gearset is divided and has a positive internal-external gear clutch arranged in similar fashion to that employed in the usual type. The rear portion of this shaft is splined and carries a sliding gear which in its forward position engages the positive clutch and drives directly through to the propeller shaft to the rear axle. When the gear is in its rear position, the drive is through the constant mesh gears, one of which is an idler, to the lay shaft and thence back to the sliding gear, which drives the tail shaft in a reverse direction. This arrangement is similar to the drive through reverse gears in conventional transmissions, but the pinion in this case is carried on a Hyatt bearing and runs on a stationary shaft supported at both ends.

The use of this auxiliary transmission enables the railcar to operate at full speed in either direction. The propeller shafts between the two gearsets and between the reverse gearset and the axle are tubular and are fitted with metal universal joints.

The rear axle is a Sheldon worm drive semi-floating type and is fitted with two sets of internal brakes operating on wheel drums, one set being hand-controlled and the other operated by pedal. Rear wheels are artillery type wood with fourteen 2 in. spokes and cushion rims fitted with flanged rolled steel tires of 37 in. diameter.

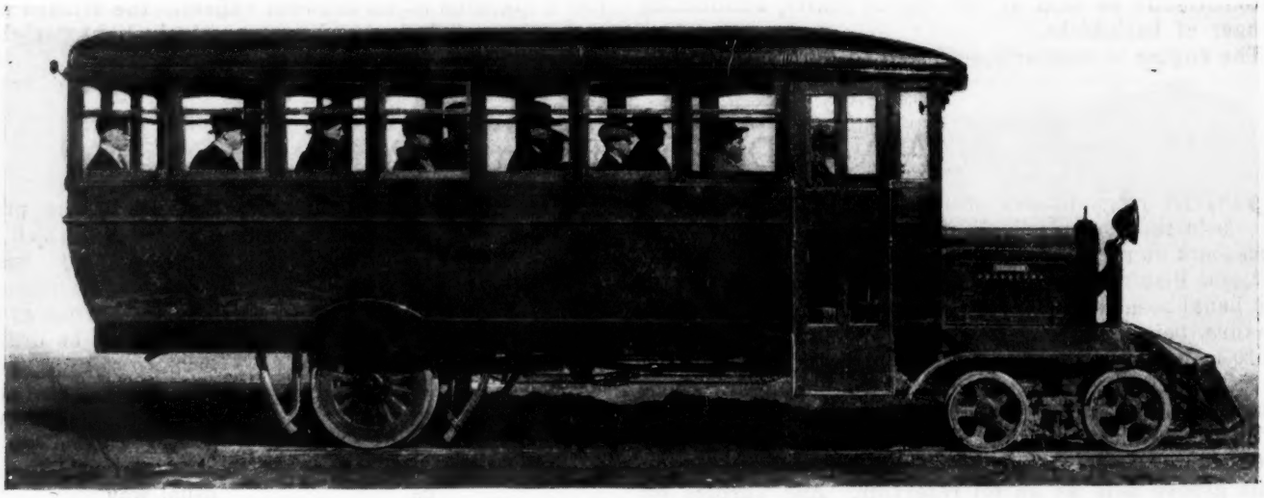
The front axle is replaced by a four-wheel leading truck built up of structural shapes hot-riveted together. The bolsters are fitted with top and bottom plates through which pass the kingpin and are provided with swing links. The wheels are of cast iron, 20-in. diameter, with chilled face and flange. They are forced on the live axles which run in bearings in cast steel journal boxes. Cast iron



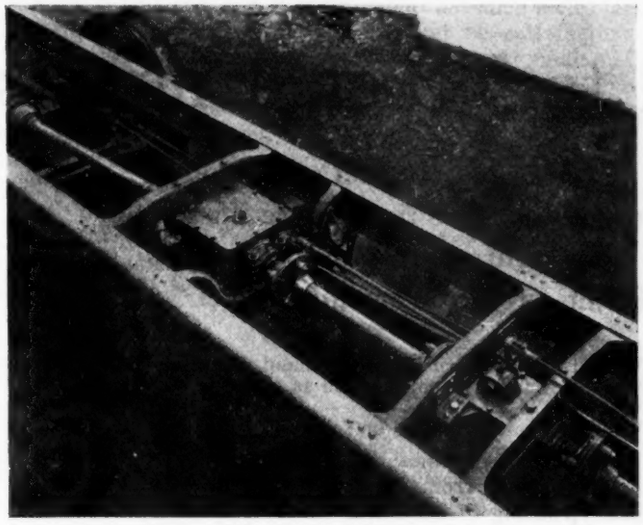
Warner high speed reverse gearset for use on railcars

brake shoes are arranged to bear on each front wheel and are applied by turning the steering wheel. The chassis frame is made of 6-in. structural channel weighing 8 lb. per ft., is hot riveted and reinforced by gusset plates. The wheelbase is 180 in. Front springs are 40 in. long by 2½ in. wide and have nine leaves. Rear springs are 50 x 3 in. and have eleven leaves.

The body is of oak and is arranged to carry thirty passengers. The equipment includes electric starting



Side view of Indiana railcar



Rear half of Service chassis showing mounting of high speed reverse and regular gearsets

motor and lighting generator, sanders in front and behind each rear wheel, steel pilot and fenders over front truck.

The Service Railcar

Another concern which has done considerable work in the development of trucks suitable for use on rails is the Service Motor Truck Co. This company has had in operation for several years a railcar based upon its standard 2½-ton, long-wheelbase model and will soon place in service a larger railcar of special design. The 2½-ton railcar is provided with a body seating 32 passengers and is capable of speeds of 25 to 30 miles an hour, depending upon the gear ratio employed. This, in turn, depends upon the grades which are to be negotiated. The car is fitted with 4¼ x 5½-in., 4-cylinder engine which drives through a single flat clutch to the Warner high-speed reverse gear, a section of which is shown herewith, and the reverse gear ordinarily used in the standard gearset is omitted.

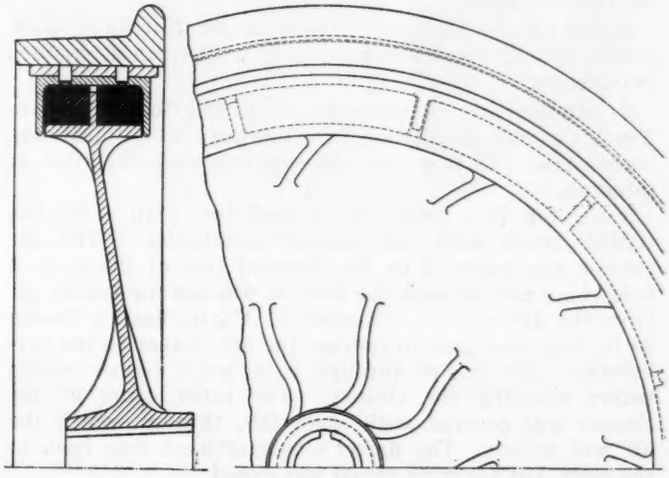
The special reverse gear is located between the engine and the standard gearset and is mounted between two frame cross-members in the manner shown in the accompanying cut.

The front axle is replaced by a standard four-wheel loading truck, manufactured by the J. G. Brill Co. This is provided with solid axles with pressed-on wheels of chilled iron. The axles are carried in plain brass bearings of the railway type, running in oil. The framework of the leading truck is a combination of structural and cast steel, to which are bolted the front springs of the regular chassis. A full-swing motion bolster, which facilitates steady riding on curves, is incorporated.

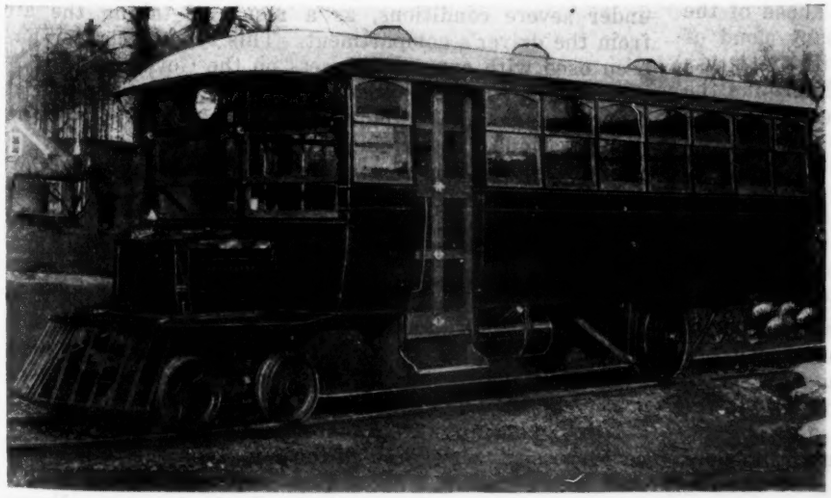
Cushion Driving Wheels

Another feature which departs from standard practice, so far as truck chassis in general is concerned, is the use of a special cushion wheel, a section of which is shown in one of the accompanying cuts. It will be noted that this wheel has incorporated between the rim and the central portion a series of rubber blocks which tend to prevent the transmission of shocks, such as those caused by passing over rail joints, to the chassis and body. The design of this wheel is such as to prevent transverse motion which can occur in some other types of cushion wheels and result in unpleasant oscillation of the rear end of the chassis frame. In this case stresses which would tend to produce such motion are taken up by contact between the side member of the box-like section containing the rubber blocks and the ring to which the spokes or disk carrying the hub are attached. In the case of the smaller railcar, wooden spokes are substituted for the metal disk shown in the cut.

The rear axle is of the worm-drive type and is fitted with the special wheels described, the latter being supplied with M. C. B. standard rolled steel tires of 32 in. outside diameter.



Sectional view of cushion wheel used on Service railcar



Service railcar fitted with entrance doors at each side

The Service railcar described is said to have traveled over 25,000 miles, during which the following data was secured: Normal speed, 30 m.p.h., will take 2 per cent grade on high gear and haul a trailer weighing about 6 tons, loaded, up a 4 per cent grade at 15 m.p.h. on third gear. Gasoline consumption is given as 10 miles per gallon and oil consumption at rate of 400 miles per gallon. The cost per day on a round trip of 84 miles, including crew, gasoline and oil and maintenance, is said to average less than $10, while the earnings are given as over $30.

Equipment includes electric starter and lighting generator, storage battery, fenders for front truck, steel pilot and hand-operated sanders front and rear of driving wheels.

Air Cleaner Applied to Truck Engines

Severe tests show effect of air cleaner on power output, fuel consumption and inlet manifold vacuum at different speeds. Five times more dust in air taken from under motor hood than from air drawn from inside driver's cab. Results and details of the experiments are given in this article.

THIS report on experimental work to show the effect of air cleaners on truck service in general, and the effect on the power and economy of engines in particular, was carried on by A. A. Bull, chief engineer of the Northway Motor & Mfg. Co. and should be of interest to truck manufacturers and operators.

Four distinct lines of research were embraced in the experimental work:

1. An air cleaner was installed on an engine in the company's dynamometer room, and the power output determined before and after installation.

2. Means for agitating dust were provided in the dynamometer room, the amount of dust provided being about the same as might be expected in normal operation, and power output, fuel consumption and increase in the inlet vacuum recorded.

3. An air cleaner was installed in the Northway Company's factory truck and records of performance obtained periodically.

4. Another air cleaner was sent to the General Motors Truck Co., for installation in a territory where dust was bothersome. In this case observations were recorded at intervals.

Following is a report of a road test with a 3½-ton G.M.C. truck with air cleaner installation. The air cleaner was mounted on the forward side of the dash, a hole being cut through the dash to provide for taking air from the driver's cab. A piece of 1¼-in. flexible tubing 20 in. long was used to connect the air cleaner to the carbureter. Air passed through a 60 mesh copper screen before entering the cleaner. The inner drum of the cleaner was covered with sheet felt, through which the air was drawn. The driver's compartment was open at the sides, but the wind-shield was closed.

The truck, with air cleaner, was driven 17.5 miles on a dirt road at speeds of from 8 to 18 m.p.h., averaging 10 m.p.h. A touring car was driven a few feet ahead of the truck, in such a manner as to stir up a heavy cloud of dust. The inner drum of the cleaner with felt was weighed before and after the road test, to determine the weight of dust collected by the felt, the results of the weighing being as follows:

Weight of drum, felt and sand after test.....1 lb. 5.97 oz.
Weight of drum, felt and sand before test.....1 lb. 5.81 oz.

Sand .....0.16 oz.

No sand passed through the felt.

Next a test was made in which the air for the engine was taken from under the hood. A new cleaner, exactly like the one used in the previous test, was installed in the same location but with the air intake facing forward, to take air from under the hood instead of from inside the driver's cab.

The test was then repeated under the same conditions except for source of air, and the weighing gave the following results:

Weight of inner drum, felt and sand after test ..1 lb. 5.81 oz.
Weight of inner drum, felt and sand before test..1 lb. 5.01 oz.

Weight of sand collected on felt.....0.80 oz.

This was five times the amount of sand collected when air was taken from the driver's cab. After each test, a heavy coating of sand was observed on the truck and engine, testifying to the severity of the tests. Inside of the inner drum there were no indications of any sand having passed through the felt.

The following table shows the effect on the power output, fuel consumption and inlet manifold vacuum at different speeds, of the clean air cleaner and the same loaded with dust.

R.P.M.	B.H.P.			Fuel Consumption Pts. per Hp.-Hr.			Negative Pressure in Intake—In. of Hg.		
	Without Cleaner	Cleaner without Dust	Cleaner with Dust	Without Cleaner	Cleaner without Dust	Cleaner with Dust	Without Cleaner	Cleaner without Dust	Cleaner with Dust
400	8.7	8.5	6.6	0.920	0.942	0.970	0.1	0.1	0.15
600	14.2	13.9	13.9	0.900	0.959	0.981	0.3	0.3	0.1
800	19.8	19.5	19.2	0.843	0.933	0.947	0.6	0.25	0.1
1,000	24.6	24.2	23.5	0.842	0.827	0.912	0.77	+0.2	+0.2
1,200	29.4	28.3	27.4	0.928	0.848	0.876	1.075	+0.2	+0.2
1,400	32.2	31.5	29.8	0.848	0.828	0.876	1.7	0.0	+0.2
1,600	34.7	33.4	32.0	0.824	0.856	0.938	2.1	0.0	1.5
1,800	36.2	34.7	32.4	....	0.824	0.926	2.6	0.3	0.6
400	4.0	4.0	4.0	1.210	....	....	9.2	4.65	2.75
1,000	10.0	10.0	10.0	1.101	....	....	11.35	9.6	8.4
1,600	16.0	16.0	16.0	1.071	....	....	11.75	10.0	8.4

Water temperature, 120°–150° F.

The dynamometer tests with reference to the effect of the cleaner on the power, fuel consumption and inlet manifold pressure were made primarily to determine the advantage of taking the air from the driver's compartment instead of from beneath the hood, in order to minimize the amount of dust drawn into the engine.

It was further decided to demonstrate whether an air cleaner of the felt filter type could operate satisfactorily under severe conditions, as a result of taking the air from the driver's compartment. This type of cleaner has been used with apparent success on the Government military trucks. It undoubtedly has a disadvantage—that it cannot handle great volumes of dust without affecting the operation of the engine.

The design of the cleaner used in these tests was similar to that employed on the class "B" military trucks, with the exception that it was mounted vertically and in such a manner that vibration of the truck would automatically clean the filter.

The usual method of testing this filter has been to introduce large volumes of dust in such a manner that ultimately the filter felt would be choked, creating a high depression in the intake manifold, resulting in loss of power and increased consumption.

It is obvious, however, that this method of testing does not represent service conditions, in that the amount of dust introduced in a short time is probably considerably in excess of that which would be obtained under ordinary

operating conditions, and it is probable that such a cleaner would fail in the test indicated and yet be satisfactory where the amount of dust handled was relatively small and it operated under such conditions that it would have a chance to clean itself. Therefore, the tests conducted were made with the idea of reproducing the very worst conditions that the truck might be expected to operate under in actual service.

From the results of the tests, it is clear that the amount of dust drawn in by the motor is five times greater when the air is taken from under the hood than when it is taken from inside the driver's compartment, and, therefore, it is preferable to take the air from the driver's compartment, whether a cleaner is installed or not, as in that case less dust will get into the engine.

Power and fuel consumption tests evidence a slight reduction in power output, together with an increase in fuel consumption when the cleaner is covered with dust. It is believed that the maximum amount of dust adhered to the filter felt, and though this test represents the worst condition that would exist under ordinary circumstances, if the carbureter were properly adjusted to provide for the added depression, there would be no increase in fuel consumption.

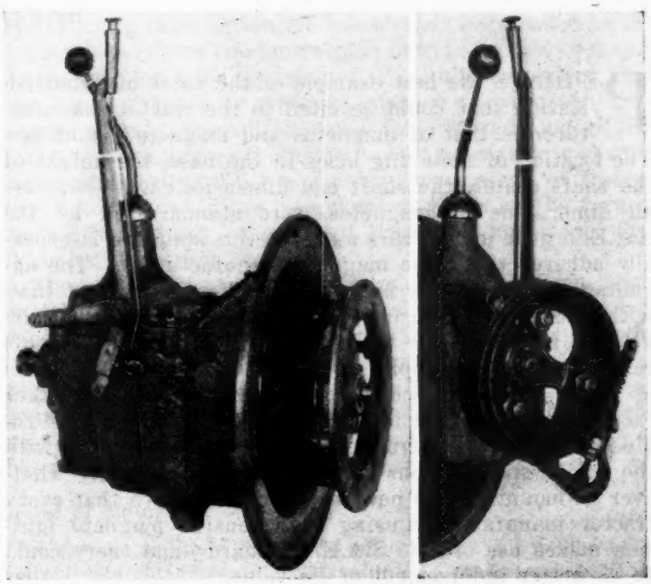
New Passenger Car Gearsets

TWO new passenger car gearsets for medium size cars and for larger cars have been brought out by Fuller & Sons Mfg. Co. Both have three speeds forward and one reverse. Short and heavy construction of the mainshaft and countershaft is intended to prevent springing apart when there is a heavy pressure on the gear teeth and to give durability, less vibration, and a quieter transmission. Provision is made on both models for attaching a tire pump if desired. A transmission brake bracket can also be attached to the rear of the transmission to accommodate Norwalk or similar transmission brakes.

When the oil level is brought to the top of the filler hole the oil level in the transmission is correct. The clutch throwout bearing is lubricated automatically by the gearset oil.

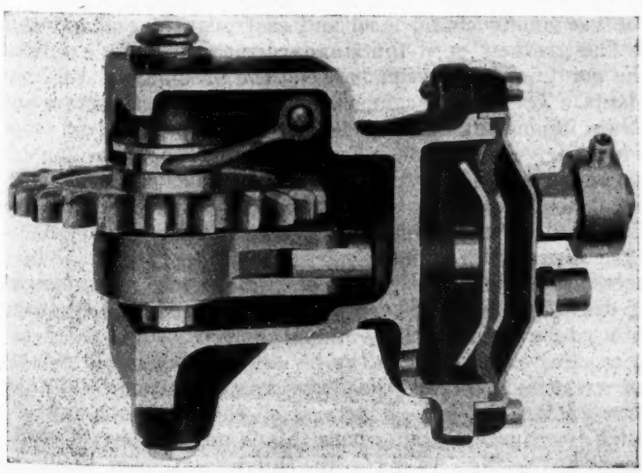
The countershaft of the Model F for medium size cars has different construction than heretofore used in Fuller transmissions. The countershaft gears are cut in one piece from bar stock, 3½ per cent nickel steel. These gears revolve on a stationary countershaft with Hyatt roller bearings. After hardening, the bore of the gears and the countershafts are ground true to assure true centers, quietness and long life. The mainshaft gears and mainshaft are also 3½ per cent nickel steel, with shafts and gear bores ground.

Model TU-5 transmission is for six-cylinder engines up to 400 cu. in. piston displacement. The clutches used with both models are the standard Fuller multiple disk construction which is standard equipment on a number of makes. The drive is through hardened steel pins to hardened saw steel disks faced with asbestos fabric on both sides.



Two views of new Fuller gearset showing also the Fuller multiple disk clutch and method of mounting transmission brake

Motor-driven Tire Pumps



Sectional view of pump

A NEW, motor-driven tire pump suitable for transmission or other type of installation in which it is claimed that the air chamber requires no oil has been brought out by the Detroit Carrier & Manufacturing Co. The pump is a diaphragm type, in which the diaphragm is driven off the pump shaft by a crank and connecting rod arrangement. The pumping is effected by the reciprocation or pulsation of the diaphragm and, consequently, requires no lubrication. The pump is so manufactured that replacement of the diaphragm is a simple matter should it become necessary and consists of but very few moving parts. It is shown sectionally herewith.

THE Province of New Brunswick, during 1921, spent a total of $400,000 on construction and improvements of roads. The total amount collected in automobile fees was but $276,322. Much of the new construction was on the road connecting the North Shore with Montreal and Quebec.

Standardization Necessary to Tractor Industry Progress

Mr. Heldt points out in this article the fundamental necessity for standards in the tractor industry and suggests certain lines for immediate action. The number of belt speeds and screw sizes might well be reduced, while uniform lug fastening would be advantageous. An interesting analysis.

By P. M. Heldt*

PERHAPS the best example of the value of standardization that could be cited to the tractor manufacturer is that of magnetos and magneto mountings. The location of fastening holes in the base, the height of the shaft center, the shaft end dimensions and the overall dimensions of magnetos were standardized by the S.A.E. a good many years ago, and this standard is generally adhered to by the magneto manufacturers. The advantage to the tractor manufacturer lies in the fact that, with possibly a few exceptions, any magneto on the market will fit his engine without special adaptation. If his regular source of supply should fail for any reason, such as a fire, strike or flood, he could arrange with any other factory to supply him temporarily with its product. Provided the mounting arrangements were in accordance with the S.A.E. specifications he would have no difficulty whatever in mounting the new magneto. I believe that every tractor manufacturer using high tension magneto ignition makes use of this S.A.E. standard—and there could be no better indorsement of its value.

Now, how does this plan of standardization look to the magneto manufacturer? We can imagine him arguing: "If it is so easy for my customers to substitute another magneto for mine, it is certainly not to my advantage; my hold on my trade will be loosened, and it is not for me to encourage standardization."

There undoubtedly has been in the past in some industries a feeling of this kind with respect to standardization, which has been the cause of much of the opposition which the movement has had to contend with. It is easy, however, to prove that this attitude has a very weak foundation. The same standardization which makes it easy for the customer to change from your own to a competitor's product also makes it easy to change from your competitor's product to yours. Therefore, unless you already control the whole of the business and have no chance of getting any more, you have nothing to fear from standardization on this score. This point is borne out by the fact that all makers of high tension magnetos are using the S.A.E. standard.

Standardized Magneto Mounting

There is, however, also a very direct advantage in mounting standardization to the magneto manufacturer. It relieves him of the necessity of manufacturing his machines separately for each customer. There are still slight variations in the demand, in respect to direction of rotation, position of timing lever, etc., but these can be readily met. With the exception of a few parts, the machines are all alike, which reduces manufacturing costs and permits of working for stock.

Another set of most important S.A.E. standards that are being used by the tractor industry are the steel standards. There is now a general tendency in tractor design to reduce weights, and this means the increased use of alloy steel in shafts, gears and similar parts. Now, the alloy steel industry has grown up with the automobile industry and is very much dependent upon it. There is no other industry that uses alloy steels to anything like the extent of the automobile industry, and the statement was recently made that 70 per cent of all the alloy steel produced in this country goes into automotive plants.

Value of S. A. E. Specifications

Alloy steels are made almost exclusively to S.A.E. steel specifications, and the parts manufactured from them are heat treated according to the S.A.E. specifications. The standardization of steel specifications and of heat treatments is among the most valuable work the Society has done. In connection with the tables of physical properties published some years ago, it enables the engineer to pick out the steel best suited to any particular purpose and to specify a heat treatment that best meets the requirements of the case. The work has not been limited to alloy steels but covers carbon steels as well, and most of the drop-forged crankshafts and connecting rods used in tractors are made of an S.A.E. specification steel. It is unnecessary to dwell upon this particular item of standardization, as the more extensive use of S.A.E. steel specifications by the tractor industry will come about naturally as the more primitive methods of construction typified by the use of structural steel and cast gears are abandoned.

The greatest need for standardization always exists at the points of connection between the products of different plants. The tractor connects by drawbar to the plow and other implement, and by belt to the separator or other power driven machine. Every tractor should be capable of connection to any plow or other implement, which necessitates standardization of the hitch; and every tractor should also be capable of driving by belt all the usual agricultural power machinery at proper speeds, which necessitates standardization of belt speeds. The height of drawbar hitch has been standardized and this standard is used by a good many manufacturers, but not by all. A moderate variation in the height of hitch is perhaps of no great moment, as the drawbar connections will take care of it. On some tractors, of course, the height of hitch is adjustable, but where this is not the case it would be an advantage to have the hitch a certain standard height.

*Paper read at the Minneapolis tractor meeting of the S. A. E.

Belt speeds also have been standardized, and, in fact, the original standard has been revised already. The belt speed was first fixed at 2600 ft. p. m., but it was found that a single speed did not meet all requirements. At the present time the S.A.E. has four standard belt speeds and the N.I.V.A. has even one more. It is possible that temporarily this number of different speeds is necessary because of the requirements of the various types of power driven machinery now on the market. The designers of these machines had nothing to guide them in determining the size of their pulleys, and the result is that there is absolute lack of agreement as to the required belt speeds. But in the future this condition could be remedied, and I believe that eventually there will be no need for more than two standard belt speeds. The situation here is somewhat similar to that in the pneumatic tire field, and I believe the problem could be solved in the same way as that tried there.

Pneumatic Tire Sizes

Some years ago, when a standard list of pneumatic tire sizes was first given out, it contained a certain number of sizes which were designated as definite standard sizes, and a number of others which, it was explained, were to be continued by the manufacturers only while the replacement demand for them continued. This served as a sort of warning to car designers that new cars should be equipped only with the definite standard sizes.

In the determination of standard belt speeds there should be co-operation between the manufacturers of tractors and stationary farm engines on the one hand—because the same agricultural machinery that is driven by tractors is also driven by stationary engines—and the manufacturers of this machinery on the other. If, say, two definite standard belt speeds were agreed upon, then the designers of agricultural machinery in future would equip all new types of machines with pulleys calculated for one or the other of these speeds, and the situation would gradually become simplified.

One class of standards relates to materials of construction or basic machine elements. Of the standards of this class that were adopted originally for the automobile industry many are now in use in the tractor industry. I need only mention the S.A.E. standard steels, non-ferrous alloys, tubes, screws, washers, pipe fittings and ball bearings. Some of the standards of this class deserve wider use, however, as, for instance, the standard forged rod ends and yokes.

Then there is a class of standards relating to the joints or connections between parts that are often made in different plants. To this class belong the magneto standard already referred to, the carbureter flange standard, the bell housing standard and others. The value of these standards is so obvious that they have generally been adopted without hesitation. As a matter of fact, most of these standards were formulated at the request of parts manufacturers, and tractor makers had little to do with their adoption.

Fewer Tractor Screw Sizes

There has been in the past some talk of reducing the number of screw sizes for use in tractors. Why this would be an advantage is easy to see. One of the difficult problems in connection with farm tractors is that of maintenance. A tractor cannot easily be transported, and all ordinary repairs must be made right on the farm with the facilities available there. Now, it often occurs in the use of tractors that screws and nuts are lost or broken or have their threads stripped, so that they must be replaced. It would evidently be much easier for the farmer to keep a good stock of screws on hand if only a few sizes were used. In all the ordinary screw standards the sizes vary in steps of 1/16 in. Why not cut out the odd sixteenth sizes in tractor manufacture? The direct benefit of simplification would not be limited to the farmers but would also be shared in by the manufacturer and the repair shop. There is, of course, one objection to the elimination of certain screw sizes. For instance, in places where a 7/16-in. screw would just suffice, a ½-in. screw would have to be used and thus the weight would be slightly increased. However, this disadvantage is far from offsetting the advantages to be gained, especially when it is considered that in some cases, by reason of the use of heavier screws a smaller number would serve the purpose. Very likely, different manufacturers of tractors are now following this plan individually, but if it has general approval, why not make it a standard or recommended practice?

Another item that deserves the attention of the tractor industry particularly at the present time is the methods of fastening lugs. Attention has already been called to the tendency to reduce tractor weight; now, in order to get sufficient traction with less weight it is quite important that the lug equipment be made as efficient as possible. Different operating conditions call for different lug equipment, and the farmer therefore finds it necessary to change lugs occasionally. With a standardized method of fastening, not only would the interchange of lugs by the farmer be facilitated, but inventors of improved lugs would find is easier to market them.

There is at the present time considerable research going on with respect to the best form of lug for different soil conditions. It is obvious that the minimum tractor weight permitting a given drawbar pull to be obtained depends to a large degree upon the lug equipment, and as reduction of tractor weight without reduction of drawbar pull spells increased efficiency, this development ought to be encouraged in every possible way.

Need of Co-operation

A few remarks of a general nature may not come amiss here. Standardization really signifies co-operative effort on the part of members of the industry, and no industry, perhaps, needs this co-operative spirit more at the present time than the tractor industry. During the war and the two years following it this industry enjoyed a sort of hot house growth, the direct result of high prices of farm products and scarcity of farm labor. Now conditions are practically reversed. Farm products sell at abnormally low prices and help is plentiful. The farmer has very little money to spend and he has no longer a prospect of an almost unlimited market for his products to encourage him to widen his scale of operations. In the past the desire to work an increased acreage was often the reason for the purchase of a tractor. Tractors retain all the advantages they ever had, such as ability to work to full capacity in all kinds of weather, lack of need for feed and care during periods of non-use, etc.; but their first cost and operating cost must be brought down in conformity with the changed economic conditions on the farms. Every manufacturer is equally interested in this problem and all should co-operate to solve it.

Standardization, while not a panacea for all the present woes of the tractor industry, will prove a powerful aid in solving its problems. It may be permissible to point to the automobile industry in this connection. There is no other branch of the mechanical industries to-day that is producing as efficiently as the automobile industry. It is not a mere coincidence that this industry also has carried standardization further than any other. Efficient production really means large scale production, because it is only in large scale production that really efficient methods are applicable. It is for this reason that a large proportion

of firms which have entered the automobile industry in recent years confine themselves to assembling. Their own output may not be so very large, but all the components which they use—the engine, transmission, axles, steering gear, etc., are made in parts factories on a generally much bigger scale. This plan of assembling would be greatly hampered—in fact, it would be almost impossible—if it were not for the standardization work of the S.A.E. To these parts factories belongs a great deal of the credit for the rapid advance in automobile design and for the efficient production methods in the automobile industry.

Summing up, there are three outstanding facts which should convince every tractor manufacturer that standardization is of value in the tractor industry:

1. This country's largest industry of manufactured products has standardized to a large extent and is keeping up the work.

2. During the late national emergency, the Government compelled standardization in many lines, because of the economic advantages to be gained.

3. European industrial countries, impoverished by the war, are turning to standardization as one means of re-establishing their economic balance.

The standardization movement would have been much further along by this time if it hadn't been for the more or less natural tendency among members of an industry to regard one another with distrust. As a rule, it requires some event of catastrophal nature to bring them together and make them see that they can accomplish more by pulling together than by each working for himself regardless of the others. The automobile manufacturers were first brought into a close union by the Selden patent situation, which was a real bogy during the early years of the industry. Many other industries learned the value of co-operation during the war. The slump in farm values is undoubtedly the greatest shock that the tractor industry has had so far, and it is to be hoped that out of the misfortune at least some good will come, that the tractor makers will see the advantage of co-operative effort, and of mechanical standardization as one of its expressions.

Four-Wheel Servo Brake

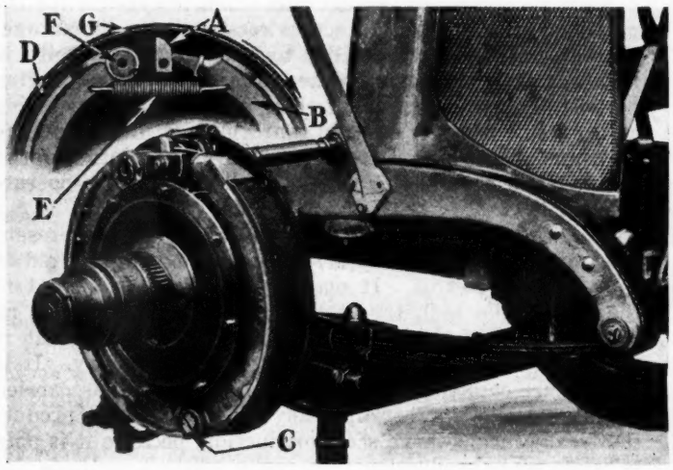
AN interesting and simplified form of servo-brake is used on the latest type of high grade six-cylinder chassis produced in the works of Farman Brothers, Paris. This car has four-wheel brakes operated simultaneously by means of a pedal, the control being on the Perrot principle. There are brake drums on each wheel, the inner brakes being hand-operated. This arrangement gives two independent braking systems, but without any braking effort going through the transmission.

The foot-operated brakes are internal expanding type, but are not mounted in the usual way, with a fixed point for each shoe and a cam to bring them in contact with the inner face of the brake drum. The brake cam A—as shown in the sketch—operates on only one shoe B, bringing it in contact with the face of the drum C. This brake shoe, which acts on the servo principle, is pinned to one extremity of the second brake shoe D, this latter having a fixed point at F. When brought into contact with the drum through the action of the brake pedal, there is a tendency for the first shoe to follow the rotation of the drum, thus pushing the second shoe and assuring the braking effort. This arrangement takes advantage of the inertia of the revolving parts without the use of any additional mechanism.

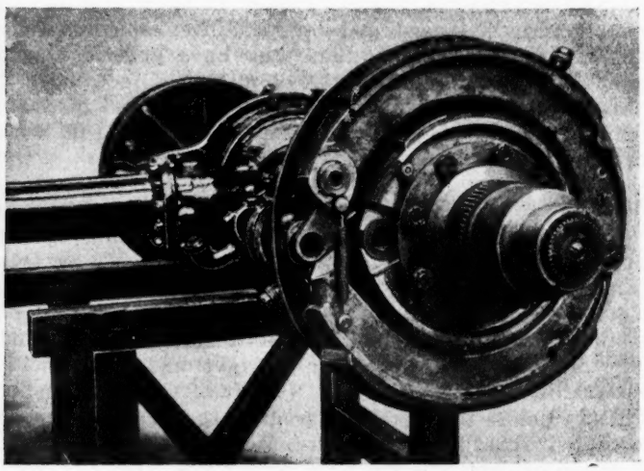
By mere alteration of the area of surface of the servo-brake it is possible, with uniform size drums front and rear and uniform brake shoes, to secure more progressive braking on the rear than on the front wheels. As the rear is less heavily loaded than the front when the brakes are applied, this prevents any tendency to skid and increases the life of tires.

An Encyclopedia of Airplane Engines

ONE of the latest books devoted to descriptions of airplane engines has been compiled by Glen D. Angle under the title "Airplane Engine Encyclopedia." In this book an effort has been made to briefly describe or at least refer to every airplane engine which has ever come to the author's attention. Most of the descriptions are necessarily very brief, but in a majority of cases a photograph and in many cases sectional line drawings of the engine are reproduced, while some of the major dimensions, the weight and power output are given in nearly all cases, and the special features of the engine are mentioned. The engines are listed in alphabetical order for ready reference. The book is published by the Otterbein Press.



Details of four-wheel brake—front



Arrangement of four-wheel brake—rear

Improvements in Gear-Box Design

Part II.

In this second article Mr. Orcutt tells the methods he employed to carry on special gear-box gear experimental tests and draws his conclusions. A detailed account is given of a new gear-tooth grinding process.

By H. F. L. Orcutt*

CONCLUSIONS drawn from some tests made on gear-box gears extending over a period of nine years in connection with the development of a special process of finish-grinding the teeth of hardened gears may prove of interest.

The number of gears dealt with runs into hundreds of thousands, including the so-called constant-mesh pinions. The sizes vary from a 15-tooth pinion to 60-tooth gears, the diametral pitches from 8 to 4, and the face widths from ⅜ in. to 1½ in. The materials include case-hardened, oil-hardened and air-hardened steels to varying specifications. The forms of teeth include the standard depths, and the stub tooth of varying pitches, with pressure angles from 14½ deg. to 25 deg.

The tests were specially for quiet running, and were made as a part of production inspection. The gears were in each case tested with only one pair running, which were mounted on spindles set to exact center distance, secured on bushes or plugs which were hardened and ground, running dead true, great care being taken in all cases to have the two spindles dead parallel. The speed selected for the driving spindle was about 900 r.p.m. The spindles of the testing fixture are 4 in. diameter, of good length, running in bearings with very small clearances, all fittings being made with special care. The driving belt is 4½ in. in width. A band brake, 3 in. wide, was applied to the driven spindle. The gears under test were run dry as well as lubricated by splashing with thin oil. The fixture itself ran without noise, and there can be no question but that any noise produced by these tests was purely a gear-tooth noise. Many of the tests have been made in direct comparison on the same fixture under identical conditions, with gears finished as accurately as possible before hardening.

The results of these tests can be briefly stated. The gears were made to run in all cases so quietly that if the same results could be secured in a gear-box it would be called noiseless on all speeds. Some of these gears ran remarkably quietly in boxes, but in very few boxes were they perfectly silent under running conditions on the road. In nearly every case they were more quiet than unground gears under load in the road test. In some cases the gears with perfectly accurately ground teeth are apparently just as noisy in the box as gears unground. In this comparison, however, the unground gears have always been subjected to special selection, stoning and very costly hand work on the teeth.

The conclusions submitted are as follows:

1. That gear-box gears which are hardened after finishing are always noisy.
2. That gears with teeth accurately finished after hardening are quiet.
3. That gears with teeth finished as accurately as possible may be noisy in the best finished gear-boxes.
4. That gears with teeth roughly finished may be under some conditions comparatively quiet.
5. That the accurately finished gear is just as essential to cheap and uniform production as the accurately finished cylindrical shaft or bearing.
6. That in a quiet running pair of gears the limits of accuracy on the teeth are the finest possible, much finer than are required in any other conjugate surfaces in the gear-box.
7. That in the ordinary gear-box the gear-teeth are usually the least accurate of any of the working surfaces.
8. That thorough development in gear-box design will not be possible unless all parts, including gear-teeth, are of accurate finish within known limits.
9. That some ratios run more quietly than others, tooth load and quality of finish being equal.
10. That the stub gear to run quietly must have extreme accuracy in tooth form, especially in pitch spacing. Consequently this gear is more difficult to finish to a degree of quiet running than the full depth tooth gear.

The tests recorded and the production work connected with them have demonstrated conclusively two things which are important to the motor car engineer. First, that in a gear giving the service required in the ordinary gear-box, if it is expected to run quietly, a perfection of tooth contact is necessary which it is hardly possible to secure by any of the ordinary gear-cutting methods. Second, that in the usual motor car gear, if it is hardened after the teeth are finished, the perfection of tooth contact necessary to quiet running is not possible. Further, in a gear with the teeth hardened after finishing the full possible tooth-wearing surfaces do not exist.

Unless these details are given full recognition, it is safe to predict that substantial progress in gear-box improvements will not be made, improvements which are desirable to put this unit in line with other parts of the motor car, and which, sooner or later, will be demanded by the public.

Much research work is necessary to determine minimum areas and sections of straight spur-gear teeth which, accurately finished and properly mounted, will run quietly under maximum loads. The known qualities so far demonstrated by test and usage are, that heat-treated gears made of special material with comparatively small straight spur teeth will stand high peripheral speeds and heavy loads, and have long life. Further, that such gears are, at a moderate cost, materially improved in running qualities when the teeth are accurately finished after they are hardened.

The following is an analysis of the sources of gear-box noises commonly observed:

1. Inaccurately finished gear-teeth impacts.

*Paper read before the Institution of Automobile Engineers, Dec. 15, 1921, condensed.

2. Ball or roller bearing influences.
3. Influences outside the gear-box, but which are manifest in the gear-box and come through either the front or rear connection.
4. The shape of the gear-box casing.
5. Weakness of gear shafts and weakness of casing.

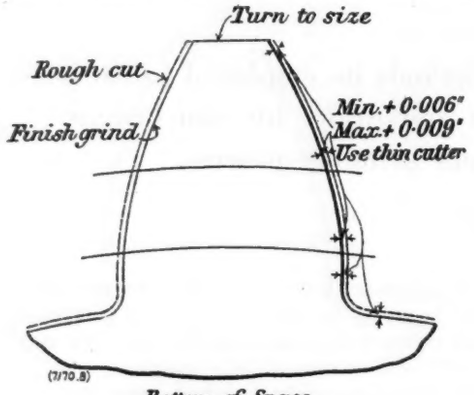


Fig. 2

6. The gear teeth being too small for the load.
7. Badly-mounted gears.
8. General bad workmanship in the box.
9. Periodic speeds in the engine.
10. Gear-box distortions caused by chassis movements.

The Gear Tooth Grinding Process

The process of gear-tooth finishing to which reference has been made is an entirely new mechanical operation, and a short description will probably be of special interest to the automobile engineer. The subject of finishing gear teeth is such a large one that it can only be dealt with in the briefest possible manner. Some of our best mechanical engineers have devoted years to the problems of machining spur-gear teeth and many of the mysteries of gear-tooth action still have to be solved. Some of the uncertainties have been cleared up in the development work which has been carried out in connection with the process to be described.

Gear-tooth grinding takes the place of the usual finishing cut on the milling, hobbing or generating machine. The cutting tool is an abrasive wheel correctly shaped to grind out the tooth space after the gear is hardened. The stock left for finish-grinding the teeth of the usual motor car gear should be enough to allow for the removal of all hardening distortions and such inaccuracies as may occur when the roughing cuts are reduced to the lowest cost. The teeth are finish-ground as a last operation with the gear truly mounted on bushes or mandrel which exactly fit the hole in the gear. The operations on a motor car gear are as follows:

Operation 1. Bore and turn.
Operation 2. Broach.
Operation 3. Rough mill teeth.
Operation 4. Round teeth.
Operation 5. Harden or heat-treat gear.
Operation 6. Sand blast.
Operation 7. Grind hole to finished size, registering the hole from the bottom of the splines.
Operation 8. Grind the ends of the hubs of the gear.
Operation 9. Finish-grind the teeth.

In Fig. 2 details are given of stock to be left on the gear teeth for finish-grinding. With these allowances rough cuts for the tooth spaces need be nothing more than a fast milling operation, and the highest possible distortions are allowed for.

(The author here describes the machine with which his experience has been had, which is an American product and has been previously described in these columns.—Editor.)

The form of tooth made use of is a pure involute, with no modifications whatever. Experience shows that the approach to accuracy in tooth finish coincides with the approach to silence.

A pair of gears with theoretically correct teeth should run silently unless overloaded or inaccurately mounted. It is found by many tests that the ordinary motor car gear which is hardened after the teeth are finished, is never accurate. It may be fairly quiet under certain conditions, but it is never of uniform quality.

The gear with ground teeth can be produced in quantities with a higher degree of accuracy and uniformity than by any other method, for several reasons. Firstly, on account of the fact that the tooth-form is controlled in the machine in which the gears are ground. Secondly, the refinements of tooth-finishing called for in a high-class gear must be within such very fine limits that no other cutting tool but the grinding wheel is capable of producing these refinements (these refinements include tooth forms, tooth-positioning and tooth-spacing). Of course, in the case of the hardened gear there is no cutting tool except the grinding wheel that can be used to give a uniform finish to the teeth. Further, the process lends itself to methods of inspection which are quite useless applied to the products of ordinary tooth-cutting machines.

In respect to the high-duty spur gear, the tooth-grinding process is specially important By a high-duty gear is meant a gear which, with comparatively small tooth area, must carry a heavy load, run at high speeds, and have exceptional wearing qualities. Such a gear calls for a combination of material with special physical properties, with a finish of tooth form to a high degree of accuracy. The physical properties are at present only obtainable by using material which may be heat-treated or hardened, and this material can only be finished by a grinding wheel. When this cutting tool is used to finish tooth surfaces, the engineer has an unrestricted choice of material. He can specify physical properties which are impossible when the steel cutter is used as a tooth-finishing tool. The choice of material is important, as the action of mating gear teeth is at high speeds, under pressure, on a line only and always sliding. Under these conditions tooth abrasion will be rapid on any material if it does not have special physical properties.

Tests and actual running indicate that high peripheral speeds on straight spur gears can be adopted when they are made from high-grade material and with specially accurate teeth. It has been recorded that a peripheral speed of 10,000 ft. per minute is now being used on a certain service with satisfactory results. The maximum peripheral speeds usually recommended for straight spur gearing are not much over 2000 ft. per minute. Even with moderately high speeds the number of tooth contacts per minute is enormous. A sixty-tooth gear of five pitch, running at 1000 r.p.m., would have a peripheral speed of about 3000 ft., and 186,000 tooth contacts per minute. It is easy to understand that satisfactory running in such a gear could only be expected when the tooth contacts are as nearly correct as possible. Any variation whatever from correct tooth form adds to tooth contact, tooth impact—a vast difference at high speeds. Correct contact means silence;

impact means noise, varying with speed and force of blow.

A gear hardened after the teeth are finished loses a large percentage of its tooth contact through distortion alone. The larger the gear the more the distortion. Measurements have been made of numbers of such gears about 2 ft. diameter, 3 pitch, 5-in. face, in which the tooth contact was not more than 50 per cent of the full area. With the teeth ground after hardening the full tooth contact is secured, giving the gear a much longer life.

Beyond these general statements there are very few data available for high-duty spur gearing. What the engineer wants to know is the minimum tooth section which can with safety be adopted to carry a certain load at a specified speed, and the materials from which the gear must be made. Tests with gears with inaccurate teeth cannot be conclusive, and reliable data cannot be compiled from such tests. It is claimed that a complete investigation of gear-tooth phenomena on straight spur gearing is impossible through any other process than one in which the abrasive wheel is used for tooth-finishing. Further work is now being undertaken on ground gears, from which records will be compiled as fast as possible.

At present the gear-tooth grinding process can only be made use of in a centralized plant, and to this there is on the part of some motor car makers an aversion. This aversion is perfectly natural and reasonable, and the attitude of the owners of the patents covering the gear tooth and splined shaft grinding machines should be explained. Ten years' work in production for the trade and in the development of the process has proved one thing which is not easy to understand, that is, that the plain spur gear, as used in the ordinary gear-box, will not run quietly unless the teeth are finished with refinements which cannot be maintained by the tooth-cutting methods commonly in use. These refinements are so extreme that even with the process now employed in gear grinding, special experience and a special staff are necessary to maintain a proper standard of workmanship on the gear teeth and the splined shaft. Further research work is necessary. This work is necessarily linked up with production, and for the time is naturally the occupation of a special staff and a specially organized equipment. The principle of working in a centralized plant has been accepted as the only one by which success could be assured in developing a new mechanical operation.

It is particularly interesting to note that the indispensable qualifications of a good high-duty gear and a good ball bearing are exactly comparable. Both must be made with a high degree of accuracy, with very fine limits of error and of specially selected and treated material. They must be correctly mounted to give good running results. A large amount of educational and instructive work has been done in connection with ball bearings before its economies were understood. The same work must be done for the accurate gear before the full possibilities of the high service it will give are commonly accepted.

(*To be continued*)

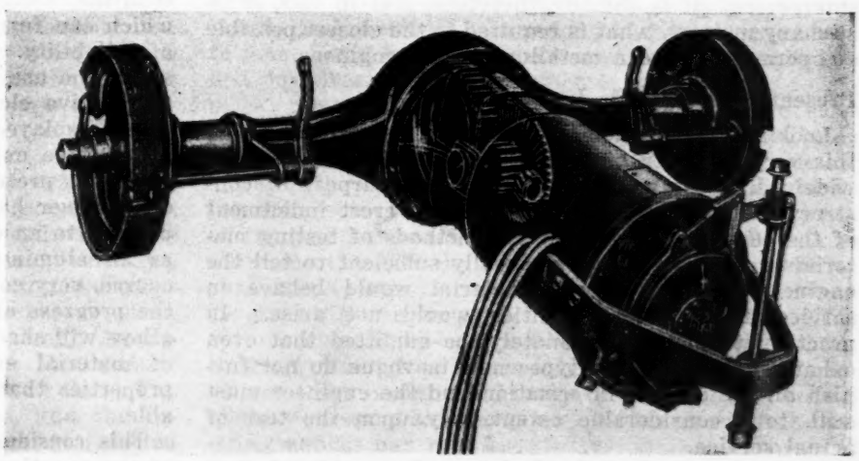
Steinmetz Double Reduction Spur Gear Axle

PRODUCTION will soon begin on the Steinmetz electric truck. The present model has a capacity of 1500 lb. and is simple in design and has an abundance of power. The motor and rear axle are of special design. Other parts of the car are of a conventional design.

Since he first became interested in the electric vehicle, Steinmetz has attacked the motor and gear reduction problems as those which were the most poorly adapted parts of the chassis. The high speed at which the electric motor operates efficiently makes it necessary to have a high gear reduction, which is objectionable in this kind of a vehicle. His first designs called for a revolving field rotating in an opposite direction to the armature. This was found to be impractical from a service standpoint, and the gear reduction is accomplished in this latest design in a double reduction spur gear axle of which the motor is a unit part.

While no definite price has as yet been set on the vehicle, it is said that it will probably be near $1,600 for the chassis. One of the innovations in electric truck merchandising will be the adoption of a standard battery, so that when the price is determined it can be quoted. Past practice has been to have so many options in battery and equipment that no very definite price can be held in the mind of the purchaser or prospect.

The truck is fitted with pneumatic tires, 33 x 5 in. There is a hood in front of the driver's seat resembling very much the hood on a gasoline truck. A portion of the battery is contained under this hood and another portion is under the driver's seat. Both sections of the battery are contained in trays and can be rolled out of the car in a very few minutes by simply disconnecting the leads and loosening the clamp bolts.



Detail view of Steinmetz rear axle and motor unit, showing double reduction drive

A PRACTICAL correspondence course in the efficient use of coal, gas and liquid fuel is now being given by the Hays School of Combustion. As we understand it, this course is primarily intended for those interested in steam power or various classes of heating plants, in which the fuel is frequently burned in a most inefficient manner.

Correlation Between Metallurgical and Service Tests

Prominent British metallurgist discusses the need for greater co-operation between those of his profession and automotive engineers with a view to developing tests the result of which can be used with greater certainty of success in selecting the most suitable metals for various purposes.

By Dr. Walter Rosenhain

THE recent and present advocacy of the employment of various aluminum alloys in automobile construction has raised anew a fundamental question which must always enter into consideration when a new and comparatively unknown material is suggested as a substitute for an old well-known and well-tried one. The question is, how does the proposed new material compare with the old in regard to those qualities which "count" for the particular purpose for which it is to be used? And it is the answer to this question which must decide, in the first place, whether the new material is to be used at all and, if so, in what quantities it is to be used—i.e. the dimensions of the parts to be made of it. Yet, frequently as such a question must have arisen in the past, there is none more difficult to answer, and the difficulty is by no means confined to the metallurgist who has explored the properties of new alloys.

After all, the answering of our question must depend in the first instance upon a knowledge of what are the physical properties of the material which really do "count" for a given purpose, and that is a question which the engineer or designer is rarely able to answer in really precise terms. On the other hand, the metallurgist in investigating a new material is confronted with equally serious difficulties of his own; methods of testing which appear reliable and exhaustive with one type of material prove far from satisfactory when applied to another, and sometimes the only way to bring out the real value of a new material is to devise some entirely new form of test. When this is done, the difficulty arises of how the results of such a test are to be interpreted. It is obvious, therefore, that in this, as in so many matters, what is required is the closest possible co-operation between metallurgist and engineer.

Present Test Methods Inadequate

Looking at the whole matter broadly, it appears that this very difficulty of estimating the relative values of widely different materials for a given purpose of construction in reality constitutes the severest indictment of the efficiency of our current methods of testing materials. If those tests were really sufficient to tell the engineer precisely how a material would behave in service, then such difficulties would not arise. In practice it must, unfortunately, be admitted that even exhaustive tests of the types now in vogue do not furnish all the desired information and the engineer must still, to a considerable extent, rely upon the test of actual service.

If the nature of mechanical tests is considered, it is not really surprising to find that they do not, and in their present form, cannot, furnish all the information needed. There is, first of all, the vital question of the reliability of a given material to be considered. Of this, the testing of a comparatively few samples chosen at random can scarcely give more than a vague indication. An internal defect here or there may easily escape detection or notice in any series of tests. When such tests are made upon material which has been experimentally produced for purposes of investigation, the occurrence of occasional defective test-pieces would naturally be regarded as an inevitable incident of experimental work. But the vitally important question arises, when a new material comes to be taken into practical use, whether it can be consistently manufactured with reasonable freedom from such defects.

From the metallurgical point of view it is probably true to say that materials produced in the wrought condition—i.e. as rolled sheets or bars or as forgings, freedom from internal defects can be assured by proper manufacturing precautions, mainly because defects generally make themselves felt during the manufacturing operations themselves. With castings, the problem is much more difficult. Some alloys present very great difficulties where the production of sound castings, particularly of difficult shapes, is desired. Where the skill of the founder is aided by rational design which does not demand castings of unfavorable form, these difficulties can generally be overcome.

Reliability Determined by Service Tests

It is, however, very difficult to see how any test other than the costly one of service experience can be devised which can furnish the engineer with data on this point of reliability. It follows that, from this point of view alone, the use of new materials must involve a certain speculative element. It is the intelligence and enterprise displayed in taking these risks that mark the progressive engineer; had they not been taken in the past, the present development of engineering practice could never have been attained. The step involved in passing to an entirely different type of materials, such as an aluminum alloy as compared with steel, is of course, very considerable. But it is quite probable that the progress of the metallurgy of the light metals and alloys will shortly confront the engineer with new types of material even more startlingly different in their properties than are the aluminum alloys already available.

This consideration adds urgency to the other aspects of our question, which may be summed up in the single

query: "What do our mechanical tests really mean?" We are told that a new material which is offered for constructional purposes gives certain tests. If it has been exhaustively studied by the available methods, we shall be furnished with data on tension tests, shear, compression, single and multiple-blow impact, fatigue, hardness and similar matters. When a metallurgist investigating a new alloy has obtained these data, he has done —from that point of view—very nearly all that can be done with existing methods.

Engineering practice, which relies upon a few tests selected from this list for the routine acceptance testing of its materials, confirms this conclusion. Yet, with all these data, can the engineer be really sure how the material will behave when used for a given purpose? The answer is, in the majority of cases, "no." If the tests are good all round, one will naturally feel some degree of confidence in the material and its tentative application will be encouraged, but a quantitative comparison with an old material of known service capacity is still not possible. Two widely different materials giving similar tensile tests and impact-test figures may yet behave very differently if exposed to shock or vibration. In most cases, too, the test data of a new material will not appear entirely "good all round"—there is frequently a price to be paid for an advantage gained in one direction by a lower test-figure in another. Can any one say at the present time what the true "exchange value" of these figures is, even for a single well-known type of material?

The controversy which is not yet at an end in regard to the relative importance of high elastic limit and high notch-bar impact figure in alloy steels shows very clearly that exact knowledge on such a point has not yet been achieved—and this, be it noted, is a joint and equal responsibility as between the engineer and the metallurgist. It is futile for either to suggest that it is the business of the other to settle these matters.

One reason why our knowledge of the fundamentals in these matters has not progressed as far as could be desired is that the attention of engineers and metallurgists in regard to mechanical testing has to a very great extent been concentrated hitherto upon one material or group of materials which possess a fairly definite correlation of physical properties. Ordinary steels, which for so long a time constituted the main materials of the great mass of engineering construction, have been very extensively studied and long experience has set up a certain amount of knowledge as to the relation of service behavior to mechanical test results. It must be admitted, however, that a good deal of this correlation is rather of the nature of tradition than real definite knowledge. Otherwise, how comes it that there is, at this time, a definite divergence of opinion upon so simple a question as the proportion of sulphur and phosphorus which can be safely admitted in certain types of steel? American and British practice differ widely in this matter, and neither is based upon any really definite data. The same remarks apply in other directions, and the insufficiency of our knowledge of this matter is reflected in widely differing specifications and in the occasional failures of parts arising from causes other than specific defects or wrong treatment of the steel.

We may sum up the matter in regard to steel by saying that through enormously extensive testing and the gradual accumulation of knowledge and impressions in regard to the service behavior of the material, we know something of the correlation of mechanical tests to service behavior in the case of steel, but even this knowledge is by no means complete.

The extensive use of alloy steels of various kinds has served to open up this question very acutely, and particularly in regard to the construction of light machinery such as the internal combustion engine intended for use on automobiles or airplanes. Here it became a question—particularly in regard to aeronautical engines —of utilizing materials to the fullest possible extent and the cost of more extensive testing and fuller investigation could well be borne. It very soon became evident, however, that the somewhat vague correlation between mechanical tests and service behavior which forms the basis for the existing use of ordinary steel, could not be extended without careful consideration and investigation to alloy steels of, apparently, much higher strength. An alloy steel showing more than twice the tensile strength of a given carbon steel, could not be exposed to anything like twice the working stresses. The rapid rise in importance of fatigue and shock tests has been due very largely to this factor, which led to the realization that it had now become necessary to know a great deal more about our various materials.

WHAT physical properties of the various metals used in automotive construction render them most suitable for the service to which they are put? This pertinent question and others of a closely related character are not easily answered, largely because tests now in common use do not fully simulate service conditions. On the other hand, actual service tests are expensive and seldom lead to conclusions applicable in other cases. The author here discusses the problem from various angles, but admits that its solution is far in the future, though steps in the right direction are being taken through research work and co-operation between the engineer and the metallurgist.

A whole series of empirical mechanical tests has consequently been developed and the results furnish the metallurgist and the engineer with a mass of data which they find it difficult, if not impossible, to interpret in any really exact manner. When, as at the present time or in the near future, we have to extend our vision to include light alloys of aluminum or of still less-known metals, the step is a much larger one. The correlation between test and service in the case of ordinary steels is adequate for working purposes; in passing to alloy steels we find it far less complete and our use of those materials remains correspondingly tentative until experience has gradually furnished us with adequate knowledge or tradition. In passing to light alloys we have to take a still longer step and need not be surprised to find ourselves in territory which is more difficult to explore. Metallurgist and engineer must therefore move forward together, with some degree of caution and using such knowledge as they both possess by way of guide.

Out of the very real difficulty which exists in interpreting the results of current mechanical tests, two schools of thought have arisen. The followers of one seek to overcome the difficulty by trying to devise tests which shall imitate service conditions as closely as possible in the hope that the imitation may be made close enough to furnish data which can be translated with approximate accuracy direct from the testing machine to service conditions. If this aim could really be achieved, the method might well serve as a temporary bridge to cover the existing gap in our real knowledge. It is, of course, at best little more than a method of trial and error. Its

advocates say, in effect, that they do not care in the least why or how a given part stands up to its work, so long as they can be sure that it really will stand up.

For immediate practical purposes such an assurance would no doubt be extremely valuable, but—it leads no further. Every modification of design or use which alters the conditions must then demand a new "imitation" test. We see this type of experimenting carried to a very high pitch in the use of the model tank for ship-design and of the wind-channel for the testing of airplanes and airship models. There, however, the laws of similarity allow of a scientific interpretation of the results and not only tests of immediate empirical importance, but systematic data leading to the formulation of fundamental principles can be obtained. Unfortunately, the difficulty of the "model" or "imitation" type of experiment are enormously greater in the case of materials and parts of construction.

The real difficulty lies in the time factor. Any "model" or "imitation" test must, if it is to be of real service for practical purposes, furnish its results in a few hours or at most a few days. Yet actual service conditions, which it is desired to imitate are such that failure does not occur, at all events until after the lapse of many thousands of hours, or—ideally—not at all. It follows, therefore, that any such "imitation" test must also be one in which the destructive forces are accentuated in order to bring about failure in reasonable time. This accentuation of the forces, however, completely destroys the value of the test, because it does not in the least follow that a given part which fails somewhat rapidly under intense forces in a test will therefore be less serviceable under the lower stresses of actual service. The apparent order of merit of a whole series of materials may be entirely reversed by merely altering the conditions of test in such a way that in one case failure occurs in a few minutes while in the other many hours are occupied. Therefore, although it is not suggested that tests of the "imitation" type are not at times useful as giving indications of behavior under complex conditions, yet they cannot be regarded as furnishing a satisfactory bridge over the gap between the testing machine and service behavior. The closeness of the imitation is not, and in the nature of things can scarcely be, sufficiently good to furnish reliable data.

The recognition of this conclusion forms the basis for the views of the other school of thought, which considers that progress along two closely related lines is required in order to bring about the desired advance in our knowledge of materials and their behavior in test and in service.

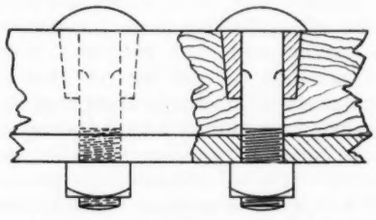
In the first place there is needed advance on the purely engineering side toward a closer analysis of the actual forces operative in the various structures and parts employed. This analysis is, of course, only possible with a concomitant advance in our knowledge of the exact behavior of our materials under moderate and medium stresses, lying not only well within but upon the border line of the elastic limit of proportionality.

On the other hand, advance in testing methods is equally required, and this should take the form of their simplification with a view to the determination of individual physical constants of the material rather than —as is done in many current tests—determining the behavior under some complex system of stresses. This is, of course, a counsel of perfection, since the advance required in both directions is very great. None the less, research activities are now so keenly active that rapid advance might be anticipated were the real value of such work realized. At the present time, a large amount of time and energy are, from this point of view, wasted upon the carrying out of complex systems of testing which do not really advance our fundamental knowledge of materials to any appreciable extent.

In view of the long distance to be covered before the desired end can be obtained by the fundamental methods just outlined, it may well be asked how the immediate difficulties are to be attacked? It is obvious that neither metallurgist nor engineer can await these developments, and immediate practical policy must be determined. This must be left, to a great extent, to the judgment and experience of the individual. That "vague correlation" which has been referred to in connection with steel, has —after all—done excellent practical service. Although it is not to be regarded as ultimately satisfactory, and though its present limitations are sometimes very evident, yet it serves for most purposes—the gap being covered by large "factors of safety" applied consciously or unconsciously in practice. And until the deeper fundamental knowledge becomes available, this same method must remain the only one which can be applied to new materials. Their use can, at first, be only experimental and tentative. Engineer and metallurgist must work together, exchanging all the information at their disposal. The application of new materials is necessarily an experimental matter; the experimental work must be regarded as beginning in the laboratory or the works of the metallurgist, but it must look to its completion at the hands of the engineer. It is not until the engineer has determined whether the material can be used for certain purposes and how it is best used, that the joint achievement of metallurgist and engineer in the development of a new material can be regarded as crowned with success.

Steel Bushings for Bolts Passing Through Wood

TO overcome the difficulty of bolts passing through wood turning in the wood a steel bushing may be used, with a squared hole where the bolt head or the squared part below the head comes. Such bushings are being marketed under the name Harbuck bushings and are made in sizes suitable for from ¼- to 2-in. bolts. They may be used in connection with carriage bolts, countersunk head carriage bolts, deck bolts and machine bolts or cap screws. The action of the bushing on all types of bolts is the same. A flush surface is obtained with all but the common carriage bolt construction. The use of these bushings is said to be particularly advantageous where the part or mechanism is subjected to shock or vibration or where it is necessary to take the bolt out and replace it frequently. Where the bolts and bushings are subject to corrosion, non-corrosive metals are used.



Harbuck bushing on carriage bolt

Results of the Nebraska Tractor Tests, 1921, Conducted by the University of Nebraska—Department of Agricultural Engineering—Lincoln, Nebraska

No. of Test	TRACTOR Name	Rating	Weight	MOTOR Cylinders	Size	R. P. M.	Make	BELT TESTS — RATED LOAD TWO HOURS Average H. P.	Average R. P. M.	Fuel Kind	Fuel Gallons Per Hour	Fuel H.P. Hours Per Gallon	Water—Gallons Per Hour	Temperature Air	Temperature Rad.	MAXIMUM LOAD ONE HOUR H. P.	R. P. M.	Fuel Kind	Fuel Gallons Per Hour	Fuel H.P. Hours Per Gallon	Water—Gallons Per Hour	Temperature Air	Temperature Rad.	Var. L. 1 Hr. R. P. M. High	Low
70	Minneapolis	17-30	6,400	4	4¾x7	775	Own	30.07	775	K...	3.46	8.70	1.00	75	208	31.95	782	K...	3.91	8.18	3.96	80	210	861	776
71	Avery	12-25	7,500	2	6½x7	700	Own	25.20	704	G...	3.12	8.08	8.00	70	210	25.08	703	G...	3.46	7.25	8.00	79	210	893	695
72	Avery	8-16	4,900	2	5½x6	750	Own	16.66	758	G...	2.15	7.76	5.50	76	210	16.76	753	G...	2.29	7.33	4.00	71	205	815	740
73	Wetmore	12-25	3,000	4	4 x5½	1,265	Weidely	25.27	1,253	K...	3.65	6.95	0.00	72	195	27.94	1,264	K...	3.46	8.08	0.64	70	206	*1,280	1,246
74	Huber "Super 4"	15-30	6,090	4	4½x6	1,000	Midwest	30.34	1,010	G...	3.29	9.23	0.08	82	181	39.79	1,014	G...	5.00	7.95	0.18	81	183	1,090	1,006
75	Lauson	12-25	4,900	4	4½x5¼	1,200	Midwest	25.21	1,214	G...	2.96	8.53	0.42	75	164	37.38	1,219	G...	5.17	7.23	0.52	64	158	1,269	1,213
76	Best "60"	35-55	17,500	4	6½x8½	650	Own	56.09	656	G...	6.97	8.05	5.00	90	209	56.33	655	G...	6.90	8.16	7.00	94	209	974	650
77	Best "30"	18-30	7,400	4	4¾x6½	800	Own	30.40	810	G...	4.55	6.68	1.50	77	201	30.43	806	G...	4.31	7.06	2.50	86	203	1,227	796
'A'	Shawnee {Power Patrol	.....	4,250	4	3¼x4½	1,400	Le Roi		For	Hig	hway	Gradi	ng O	nly					No	Belt	Pulle	y			
78	Russell "Giant"	30-60	22,180	4	8 x10	525	Own	60.35	534	K...	11.98	5.04	7.63	100	200	66.13	532	K...	16.18	4.09	6.00	107	200	600	529
79	Hart-Parr	—20	4,110	2	5¼x6½	800	Own	20.12	808	K...	2.27	8.86	1.00	87	190	23.01	811	K...	2.56	9.00	1.29	84	183	858	808
80	Eagle	16-30	7,210	2	8 x8	500	Own	30.25	505	K...	3.65	8.28	2.35	95	185	31.80	503	K...	4.24	7.50	2.68	87	172	605	496
81	Eagle	12-22	6,090	2	7 x8	500	Own	22.41	507	K...	2.83	7.92	2.00	81	191	23.35	503	K...	3.18	7.34	2.12	90	191	555	501
82	Allis-Chalmers, 12-20	14-27	4,550	4	4½x5¼	1,100	Midwest	27.28	1,102	G...	2.81	9.71	0.26	98	180	33.18	1,105	G...	3.86	8.60	0.34	85	181	1,238	1,074
83	Allis-Chalmers, 18-30	22-38	6,640	4	4¾x6½	930	Own	38.62	942	G...	3.94	9.81	1.16	87	169	43.73	937	G...	4.72	9.27	0.97	77	173	1,080	937

No. of Test	TRACTOR Name	Rating	Weight	DRAWBAR TESTS — RATED LOAD TEN HOURS H. P.	Pull Lbs.	M. P. H.	Engine Speed R. P. M.	Wheel Slip % Pt. of Lugs	Wheel Slip % Face of Rim	Gear Used	Lugs Used	Fuel Kind	Fuel Gallons Per Hour	Fuel H.P. Hours Per Gallon	Water—Gallons Per Hour	Temperature Air	Temperature Rad.	MAXIMUM Pull Pounds	MAXIMUM M. P. H.	Miscellaneous Total No. Hours	Miscellaneous Lub. Oil. Gal.
70	Minneapolis	17-30	6,400	16.88	3,065	2.06	790	11.90	2.02	Low	Angle	K...	3.46	4.87	0.50	64	179	3,921	1.88	35	8½
71	Avery	12-25	7,500	13.77	2,441	2.12	684	9.60	1.50	Low	U-Cleats	G...	3.87	3.56	5.00	83	210	2,500	2.02	35	8½
72	Avery	8-16	4,900	8.23	1,366	2.26	783	12.00	2.40	Low	Spuds	G...	1.92	4.28	3.55	71	209	1,690	2.22	42	10¾
73	Wetmore	12-25	3,000	13.28	1,477	3.37	1,235	14.00	5.60	Inter	Angle	K...	2.88	4.61	0.04	62	176	2,260	2.67	32	5
74	Huber "Super 4"	15-30	6,090	17.27	2,264	2.86	1,004	9.10	—2.70	Low	Cone	G...	3.14	5.49	0.14	76	173	3,645	2.76	32	4¾
75	Lauson	12-25	4,900	12.81	1,599	3.01	1,175	8.70	—2.60	High	Spade	G...	2.75	4.64	0.22	71	152	2,985	2.63	32	3
76	Best "60"	35-55	17,500	35.31	5,093	2.60	692	1.25	.....	High	Crawler	G...	5.66	6.24	0.16	86	187	7,500	2.44	45	23½
77	Best "30"	18-30	7,400	19.75	2,537	2.92	810	0.70	.....	High	Crawler	G...	3.77	5.24	2.55	82	202	2,445	3.11	47	19
'A'	Shawnee {Power Patrol	.....	4,250	5.85	1,293	1.70	1,492	17.80	9.30	Low	Angle	G...	2.21	2.65	0.03	80	202	1,648	1.71	32	3½
78	Russell "Giant"	30-60	22,180	30.60	5,656	2.03	574	5.10	—0.60	Low	Angle	K...	11.94	2.56	5.45	79	166	8,800	1.85	40	22¼
79	Hart-Parr	—20	4,110	11.23	1,406	3.00	760	7.04	—6.98	High	Spade	K...	2.07	5.42	0.56	87	190	1,690	2.97	30	2½
80	Eagle	16-30	7,210	17.15	2,116	3.04	460	4.74	—7.64	High	Spade	K...	3.12	5.49	1.10	87	194	2,200	3.00	38	4¼
81	Eagle	12-22	6,090	12.81	1,553	3.09	469	5.10	—6.80	High	Spade	K...	3.10	4.13	1.90	83	180	1,665	2.92	47	4¾
82	Allis-Chalmers, 12-20	14-27	4,550	15.13	1,771	3.20	1,094	7.58	—4.46	High	Spade	G...	2.60	5.32	0.23	91	168	2,560	3.14	41	7½
83	Allis-Chalmers, 18-30	22-38	6,640	23.72	2,780	3.20	951	10.80	0.15	High	Spade	G...	4.00	5.92	0.27	79	167	3,075	3.10	41	9

*Hand controlled.

Test No. 70. Minneapolis 17-30. Own governor, "Dixie" "H T 46" magneto, Kingston "E" carbureter. Fan belt adjusted. Clutch and valve rods adjusted once.

Test No. 71. Avery 12-25. Own governor, K-W "T K" magneto, Kingston "E" dual carbureter. Ground one exhaust valve. Replaced original plugs by long skirted plugs. Pistons were turned down 0.005 in. Compression low on rear cylinder. Changed from kerosene to gasoline tractor.

Test No. 72. Avery 8-16. Own governor, K-W "T K" magneto, Kingston "E" dual carbureter. Pistons turned down 0.006 in. Ground all valves. Ground exhaust valve front cylinder. Relieved all piston rings. Changed to gasoline tractor. Kerosene gasifiers replaced by gasoline adapters.

Test No. 73. Wetmore 12-25. Weidely governor, Splitdorf Aero magneto, Schebler "AT" carbureter. No adjustments or repairs.

Test No. 74. Huber Super Four. Taco governor, Kingston "L D 4" magneto, Kingston "L" carbureter. Cleaned carbureter. Replaced magneto; old one had poor contact points. Changed all plugs.

Test No. 75. Lauson 12-25. Taco governor, Dixie "46 C" magneto, Kingston "L" carbureter. Replaced all spark plugs. Tightened clutch. Broke clutch shoe.

Test No. 76. Best "60." 35-55. Own governor. Bosch "Z R 415" magneto, Ensign "G" carbureter. Valves were ground. Air cleaner removed. Changed carbureter horn from 2 in. to 3 in.

Test No. 77. Best "30." 18-30. Own governor, Berling "E Q 41" magneto, Ensign "G" carbureter. Magneto timing advanced 5 deg. Inlet in carbureter drilled to standard size, original opening too small. All valves were ground. Steering clutches adjusted. Steering arm broke.

Test No. 78. Russell Giant 30-60. Pickering governor. Bosch "D U 4" magneto. Kingston "E" dual carbureter. Fan belt replaced. Tightened fan belt. Belt lagging came off pulley. Radiator replaced by larger one. All valves were ground. Clutch adjusted. Valve spring broke and was repaired.

Test No. 79. Hart Parr 20. Own governor, K-W "T K" magneto. Stromberg "M" carbureter. Fuel line cleaned. Breaker points on magneto readjusted.

Test No. 80. Eagle 16-30. Own governor. Dixie "462" magneto. Schebler "A" carbureter. Adjusted clutch. Cap came off connecting rod grease cup. Burned out right connecting rod bearing.

Test No. 81. Eagle 12-22. Own governor. Dixie "462" magneto. Schebler "A" carbureter. Magneto timing advanced. Carbureter float adjusted. Pistons replaced by higher compression type. Cotter key in end of transmission drive shaft sheared off. Connecting rod grease cups came loose unless tightened with pipe wrench. Bolt came loose on shift bar. Air intake pipe diameter increased to 3 in.

Test No. 82. Allis-Chalmers 12-20. (14-27.) Own governor. Dixie "46 C" magneto. Kingston "L" carbureter. Gasoline feed line broke at tank. Carbureter cleaned. All valves ground. Magneto timing retarded. Two spark plugs replaced and all plug points adjusted. Cylinder blocks removed and top rings on pistons 1 and 2 found sticking. Oil pipe line broke.

Test No. 83. Allis-Chalmers 18-30 (22-38). Own governor. Eisemann "G 4" magneto. Kingston "L" carbureter. Carbureter float adjusted. Clutch fork replaced. Carbureter replaced. Air washer redesigned and air space increased. Water tank connected to air washer.

Test A. Shawnee power patrol. Road grader. LeRoi governor. Berling "E 41" magneto. Schebler "AX 66" carbureter.

The Future of Commercial Aviation

Views of two authorities which were expressed at the recent British Air Conference. In this article one gives an outline of what must be done if commercial aviation is to progress, while the other shows a comprehensive survey of civil aviation in the different countries.

"IF civil aviation is to have any future there is only one way and that is to carry more passengers and yet more passengers. Given even a moderate percentage of traveling public, civil aviation could be made to pay its own way within five or six years." This is the immediate future of civil aviation as expressed by Lieut.-Col. W. A. Bristow in his address before the British Air Conference, Feb. 7, 1922.

Col. Bristow goes on: "On a basis of a week of seven days the minimum number of passengers necessary for the profitable operation of any one company engaged in aerial transport is not fewer than 500, and these must be carried in the most efficient machines operated by an exceedingly skilled and highly organized personnel. There are many who will consider this figure excessive, but probably few will dispute the statement that the present number of passengers must be increased several times over before the business of aerial transport can be carried on at a profit without the assistance of subsidies."

Col. Bristow has in mind, of course, aerial transport between London and Paris, where three French and two British aerial transport companies operate, but all with subsidy assistance, which alone has made a continuation of the service possible. Drawing attention to the impossibility of any aerial transport, carrying few passengers, and attempting to operate without a subsidy, Col. Bristow adds: "What other transport company could afford to keep a staff of such proportions for fewer than fifty passengers per week, taken as an average over the entire year? In some aerial transport lines the persons employed on the working of the fleet number more than the passengers carried. No other form of transport could live long under such conditions, however efficient the vehicles or methods."

Col. Bristow is firmly convinced that the lack of passengers in sufficient numbers to make aerial transport a financial success, is due to a fear of accident by the traveling public, and that a broad educational program is essential before subsidies can be discontinued. Here are his views:

"By what means are we to attract the far greater number of passengers necessary? At present no real concerted effort is being made by the operating companies to attract the public. Much of the advertising and propaganda of the operating companies is aimed at securing as big a share as possible of the numbers already traveling by air, but little if any to encourage the general use of the air way. Before we could answer the question as to how to increase the number is to be done, it will be necessary to try to form some idea as to the main reasons that keep the public back.

"It is considered that the chief reason lies almost wholly in the fact that insufficient attention has been concentrated upon the problem of making flying really safe, and secondly we have not made it look and feel as if it is. I am now not speaking of any one company, or of even any one country, but as a result of a close examination of the commercial air fleets of the world, and after talking with hundreds of passengers and timid inquirers after knowledge, I am forced to the conclusion that the question of safety is the most important, and the one most urgently calling for treatment, if even a moderate proportion of the traveling public is to be converted.

"We are rather apt to think that the public know little of the factors determining safety in flight, and that to them all airplanes are very much alike. Experience has shown this idea to be completely erroneous. The author has heard many conversations that show the contrary to be the case, and on more than one occasion has witnessed passengers refusing to travel in a machine which they did not consider safe or sufficiently comfortable.

"The experience of last year has revealed several points that require serious attention, even although the number of fatalities and injuries are low, and in the case of the British the cross-channel service was actually nil. As, however, all companies have to suffer if anything impairs the confidence of the public, it is necessary to survey the European services generally, and the operations of some have undoubtedly given cause for considerable misgivings. Probably the most serious cause of accidents has been lack of skill and judgment on the part of the pilots, although it is necessary to except the British pilots from this generalization.

"On the Continent and in America, however, there is considerable room for improvement, not only in the flying methods but in the qualification deemed necessary by the operating companies for pilots that are to be entrusted with passengers to be taken on long and difficult routes. It seems almost impossible, but it is a fact, that pilots are sent off with passengers on long routes over which they have never flown before to land on airdromes they have never seen. It is considered by many that the question of training of suitable pilots is one calling for the most serious attention by all those concerned with the control and operation of commercial aerial transport."

Commercial aviation as carried on up to the present can scarcely be taken as a criterion of what the future of it will be, and Col. Bristow considers "it a probably fair statement that commercial aviation has up to the present been little more than a full scale experiment with apparatus largely of a makeshift and temporary character."

He goes on: "In spite of these limitations the results have been of an extremely interesting and valuable character, and the greatest credit is due to those who have in face of serious difficulties carried ever-increasing loads with factors of regularity and safety of a high order."

In the first place, he continues, "We have to recognize that at present it is not possible to carry on the business without a subsidy in some form or another, and therefore the character, allocation and working of the subsidy system, will have a most important effect on development. . . . The London-Paris route has been one of the best in Europe to experiment with and operate on a subsidy basis. It possesses inherent advantages not to be found

elsewhere. It is about the right length for severity of test, the wide strip of water necessitates a high standard of reliability, and the rapidly fluctuating weather conditions along the whole route compel the rapid development of the two great guardian services of aviation, namely, meteorology and wireless telegraphy and telephony. In addition, the two termini, London and Paris, and the general operations on the route are controlled by different countries with different ideas and methods, and no doubt much of the progress that has been made is due to the mutually instructive effect by such an arrangement. Regarded as an experimental laboratory for the instruction of designers, constructors and operators, an international route is almost bound to be of greater value than any purely national one.

The London-Paris Route

"From a commercial standpoint, the London-Paris route has great advantages. The actual journey by land and water, with its changes, delays and vexatious examinations, is rendered far more troublesome than its mere length would indicate, and very few people who have experienced the convenience and speed that can be obtained on this route, in any reasonably suitable airplane, will feel inclined to revert to the old means of travel. The number of passengers is enormous, and in addition to the subjects of the two countries there are scores of travelers and visitors from every country in the world who yearly pass between the two capitals.

"There are hundreds of routes that could be opened up to air traffic to advantage but it is considered that success in these will best be assured by first hammering out the many technical and commercial difficulties on our own doorstep, and the Paris-London route is especially suitable for this purpose."

Col. Bristow is firmly convinced that commercial aviation will have a greater influence on military air craft than the latter will on commercial development. He believes that progress in flying generally and especially in connection with the design of machines and engines, depends largely upon actual flying experience, and already most of the flying all over the world is done by commercial aircraft. Progress in designing military aircraft is, therefore, to an important extent, directly dependent upon the rate of evolution of commercial aircraft. Further, and this is of vital importance, it is considered that progress can only be continuous if the ranks of aeronautical engineers are constantly replenished with new blood.

Commercial Aviation Aid to Military

On this Col. Bristow says: "It is hardly possible that the profession of aeronautical engineering can be built up on the requirements of military aircraft alone, so that it may well be that the future superiority of British naval and military air fleets will depend mainly upon the growth of commercial aviation, although the actual differences between civil and military aircraft may be as great as that between a Hood superdreadnaught and a Mauretania."

Col. Bristow does not believe that the new designs of the aircraft engineer for commercial aviation will be able to so increase the earning capacity of the machines that present losses in operation can be turned into profits. He says:

"The first item that has to be recognized is the impossibility of at present making anything but a financial loss from the operation of commercial aircraft, although on paper it can be shown with comparative ease that the conveyance of passengers and goods by air can be attended with the happiest financial results even without the assistance of a subsidy. It is so tempting to work out the cost of gasoline and oil for four trips, London to Paris, per machine per day, deducted from gross receipts, calculated upon the assumption that machines are always full, and out of the handsome balance provide for maintenance and depreciation, and a dividend of 200 per cent per annum. In practice it works out differently. With the aid of the present subsidy schemes in Europe, some air transport companies may be showing a profit, but in analyzing the real position, it is necessary to omit the subsidy items from the accounts. It is clearly impossible to wipe out all aerial transport losses by improvements in thermal and aerodynamic efficiencies. . . . Improvements in equipment, organization and methods of operation are all most valuable, and must on no account be neglected, but the sum of them all will not be sufficient to turn the scale."

Col. Bristow believes that a very severe form of testing planes is necessary to show their stability before the public will lose its present sense of fear in aerial transport. He suggests that before a commercial airplane could receive a certificate of air worthiness it would have to make ten forced landings on a given route, immediately upon receiving wireless instruction from the ground, and that moment selected entirely by the wireless operator. Few might care to accompany the machine on such a test, but the majority of pilots in the course of a year will probably have to make forced landings under difficult conditions. He further believes that airdromes must be much more thoroughly equipped than at present, and declares, "there is not a single public airdrome properly equipped with apparatus by which loaded airplanes can be weighed, or the position of their center of gravity determined, and it is nothing short of remarkable that more accidents do not occur, as a result of ignorance as to these two vital factors."

Practical Suggestions

Col. Bristow has many other suggestions of a practical character that should be carried out before civil aviation will be as attractive to the public as it must be in order to insure patronage to make it a success. Here are some of the suggestions:

On each aerial route there should be a wireless operator who acts solely as a watcher and guide to the machines in the air. He should not be engaged in transmitting other messages, but engaged solely in serving the machines in transit.

At present on the London-Paris route the weather reports are often many hours late and unsatisfactory, with the result that on many occasions passengers have been landed in all sorts of out-of-the-way places.

Silencers should be fitted as their absence prevents the operator making full use of the wireless telephone, the engine noise adversely affects the safety of the machine in that it prevents the pilot hearing any unusual noises in his engine, and most passengers complain of deafness after a flight, and also of not being able to talk, except with greatest difficulty while on the route.

Aerial cabins are either too hot or too cold, and no serious endeavor has been made for ventilation. Traveling from London to Paris recently the temperature in the cabin was 32 deg. Fahr. for over two hours in addition to which there was a draft of about 500 ft. per minute. Frequently no passengers have food between breakfast and 4 o'clock in the afternoon when they make this trip.

The permissable 30 lb. of baggage carried free has been a great source of trouble. This is only a relatively small proportion of the baggage that passengers carry. In many cases it is impossible to take excess baggage on the plane, and when done it is a very expensive luxury. Baggage divided this way has given no end of trouble, and many times aerial passengers spend three or more days in the hotel waiting for their baggage to arrive. There is

"IF civil aviation is to have any future there is only one way and that is to carry more passengers and yet more passengers. Given even a moderate percentage of traveling public, civil aviation could be made to pay its own way within five or six years."

sometimes plenty of room in the fuselage for baggage, but the doorway is too small to permit of using the space.

Life assurance companies should be persuaded to allow ordinary flying under the terms of the standard life and accident policies. It is not likely that people who have paid premiums for years are going to travel by a route on which their policies are rendered null and void in the event of their death. It is a very bad advertisement for civil aviation that almost every life and accident policy in the country places a complete ban on flying. It will be a red-letter day in the history of commercial aviation when this restriction is removed.

Col. Bristow would have flying a part of the curriculum in every school in the country in order that the rising generation may be taught to regard air travel not as a romantic novelty, but as one of the sober facts of life. He would have the history of flying, the development of commercial aerial transport, and the engineering and scientific aspects of flight taught. He would use the movie as a factor in aerial education. Lastly he suggests an educational propaganda among industries.

Col. Bristow recommends a very big reduction in rates for aerial travel. The old price for a ticket from London to Paris was ten pounds sterling, and when this was reduced to eight the number of passengers increased very considerably. He believes the single fare will have to be reduced to four pounds sterling before the necessary increase in passenger traffic can be obtained.

A revised policy for research and experiment in connection with the problems associated with the development of civil aviation is needed. There is immediate need for machines of the latest types and a large number of engines.

Most important is an establishment for the adequate training of commercial pilots, which training must be much more comprehensive than that needed for pilots during the war.

Information of a valuable nature on the present and future state of commercial aviation was given at the Air Conference by Lord Gorell, Under-Secretary of State for Air.

The relationship between military and naval aviation, which may be designated service aviation for convenience, and civil aviation, was well established when he expressed the thought that service and civil aviation complement each other, and that the closest parallel is that of the relationship between the Mercantile Marine and the navy. The navy maintains peace and order on the seas; the mercantile marine transports passengers, goods and mail, and in case of need assists the activity of the navy. The parallel may be regarded as holding good in another respect: The development of the mercantile marine was by direct government action, and it did not depend on subsidies for its expansion, but rather on fundamentally sound commercial principles. Such, Lord Gorell believes, is the true view of civil aviation.

The one great essential for civil aviation is that of constant scientific research; in fact, research is the essential length between service and civil flying.

In commercial aviation the incorporation of the airship must not be overlooked. In this field the best hope of successful development lies in private enterprise conducting the service for profit, just as the mercantile marine has been developed on a business basis. Aerial transport has been hindered a little by what may be termed the exclusive enthusiasm of advocates of airplanes and airships respectively. It is a mistake to concentrate regard wholly upon one or the other; the functions of both, though rather different, are concerned with transport through the air, and the capabilities of each should supplement those of the other. The airship can be employed most economically over long distances, and the airplane most economically over distances which, though of considerable length, are yet much shorter. Lord Gorell reminded the Air Conference that a recent airship report stated that if airship service were maintained for a minimum period of inauguration of one year the establishment of the route from England to Egypt could be definitely begun and tentative flights made beyond Egypt in the direction of India and South Africa at an estimated cost of £540,000. If the service were to be maintained for a two-year period a regular monthly service to Egypt could be established, the definite extension to India begun, and demonstration flights carried out toward South Africa at an estimated cost of £1,339,000. . . . If it were decided to establish an Imperial Service on a definite basis, the construction of new airships, and of fully equipped permanent basis in South Africa and Australia would be necessitated. It is considered that this establishment could not be completed under five years and that estimated cost would be £8,000,000.

Lord Gorell gave a comprehensive survey of civil aviation in different countries.

Germany is fostering airship development by the means left at her disposal by the Peace Treaty. Her scientists are probing the constructional problems connected with large airships, and every effort is being made by financial and other assistance to maintain her technical staffs and air bases in existence. German commercial interests are negotiating with foreign countries with a view to the development of airships and airship services abroad. Plans are being discussed for an airplane service between Spain and Argentina.

France has decided to provide six airship stations, two in France and four in North Africa.

Italy is discussing plans for maintaining an airship service between Rome and Tripoli, Africa, first for mails and later for passengers.

In Italy aircraft is leased temporarily to private aviation companies for training purposes, and the budget for 1922 included grants to Swiss companies to assist them in purchasing modern airplanes. Aerial transport lines receive further subsidies based on the number of pilots they keep in training. An airdrome is to be established at Constance for international traffic with Germany.

Aviation in Holland

The 1922 budget of Holland includes 1,315,000 florins for civil aviation, of which 370,000 florins were set aside for subsidies for air transport companies. During the summer of 1921, 289 flights were carried out between Amsterdam and London, 278 between Rotterdam and Hamburg and 433 between Amsterdam and Paris. There were 1511 passengers, 30,856 kg. of various articles, and 1395 kg. of mails carried.

In Czecho-Slovakia the vote for civil aviation in 1922 was 9,080,000 kroner as compared with 6,850,000 kroner for 1921. One company will receive a subsidy of 6000 kroner in connection with the Paris-Prague air service.

The total civil aviation vote in France for 1921 was

184,500,000 francs, or 55,000,000 francs more than in 1920. Of this, 33,000,000 francs were allocated for subsidies and 25,500,000 francs for two rigid airships, airship bases and supplementary equipment. For 1922 the aerial budget is 152,000,000 francs, of which 46,000,000 is for subsidies.

In Canada the $700,000 voted for 1921-1922 has been used for the survey of air routes, regulation of flying, acquisition and maintenance of civil air stations and work has been carried out for forest patroling, fisheries protection, surveying, anti-smuggling operations, etc. The Air Board lends airships and airplanes to commercial companies free of charge under certain conditions. Between April and July, 1921, there were made 518 flights on civil government aircrafts, 73,000 miles being covered. No direct subsidies for commercial air services have been given.

Australia allocated £54,000 to be spread over three routes: Geraldton to Derby (Western Australia), 1195 miles—subsidy £25,500; Sidney to Adelaide, 795 miles—subsidy £17,500, and Sidney to Brisbane, 590 miles—subsidy £11,500. The saving in time to passengers traveling from Sidney to Brisbane and Adelaide is 18 and 14 hours respectively.

During part of the summer of 1921 an air transport service was maintained between Stockholm, Sweden, Reval and Riga. In all, 31 trips were made in each direction, and 17 passengers, 575 pounds of merchandise, and 1480 lb. of mail carried. The average time from Stockholm to Reval was 2¾ hours as compared with 24 hours by boat.

Belgium in 1921 voted 10,000,000 francs for civil aviation, of which 1,600,000 francs were for subsidies. The subsidies were equivalent to a 200 per cent addition to the receipts from passenger fares. There was a big increase in aerial traffic between Belgium and England during the summer of 1921, as compared with 1920. In the 5 months, May to August, inclusive, in 1920, only 49 passengers were carried in Belgian machines between Belgium and England, 38 journeys being made. During the same 5 months in 1921 there were 597 passengers carried and 339 journeys made.

Civil Aviation in France

There has been a very great development in civil aviation in France in the last few years due to its subsidies.

In 1919 there were only 3 companies operating on 3 routes, but in 1921 regular and frequent services, worked by 7 different companies, were in operation from Paris to London (3 services each way daily); Amsterdam via Brussels (once each way daily in addition to direct services 3 times a week to Amsterdam), Warsaw via Strassburg and Prague (once daily), and from Toulouse to Casablanca (four services each way weekly), Bordeaux to Toulouse and to Montpelier (once daily), from Montpelier to Nice (twice a week each way), from Bayonne to Santander (daily), and there was also a service from Paris to Le Havre to connect with transatlantic steamships, operated by the Compagnie des Messageries Aériennes, which is also responsible for the greater part of the journeys between Paris and London. The services between Paris, Prague and Warsaw are carried out by the Cie Franco-Roumaine de Navigation Aérienne, which is subsidized by the Czecho-Slovak Government as well as by the French, and also receives important privileges from the Roumanian and Polish governments. In a period of about 12 months ending last September the company's machines covered 156,520 miles and carried 500 passengers, 80 tons of goods and 300 mail bags. An extension of the service in the spring from Prague to Constantinople is proposed.

Arrangements have been made by the Government for civil pilots liable to mobilization to have opportunity for one hour's flying a month free of charge at any one of five training centers for reserve pilots, which are organized under the control of the Service de la Navigation Aérienne.

"IT is probably a fair statement that commercial aviation has up to the present time been little more than a full scale experiment with apparatus largely of a makeshift and temporary character. In spite of these limitations the results have been extremely interesting and valuable."

The following statistics illustrate the total work carried out by French civil aircraft from Jan. 1 to Sept. 30, 1921:

Number of flights	5,115
Number of machine-hours flown	14,100
Average duration of each flight	2 hr. 45 min.
Approximate machine mileage	1,145,500
Number of passengers carried	8,761
Weight of goods carried, in tons	126

The French air traffic between Paris and London showed a considerable increase last year. Between April and September the number of departures and arrivals of French machines to and from the Continent amounted to 1058, compared with 408 for the corresponding period in 1920, while the number of passengers carried in French machines was 3449, as against 312.

The development of aviation in French colonies must also be noticed. A mail service is operated in Syria three times a week, which covers the 75 miles between Aleppo and Alexandretta in 1 hour, whereas the only alternative means of transport—a combination of rail and steamer—occupies between 8 to 10 days.

A proposal is also on foot for linking up Paris, Marseilles and Algiers by an airship service, and to establish airplane services between Algiers and Biskra and between Algiers and Casablanca. For subsidizing these routes 1,000,000 francs was included in the Algerian budget for 1922.

In the United Kingdom the greatest activity in civil aviation was during the summer months. During August, 1921, 155 flights in British machines to the Continent carried 920 passengers. During the summer months—April-September inclusive, two daily services were operated between London and Paris, when 4006 passengers were carried. The British machines carried 500 more passengers than the French machines, but the French carried the greatest proportion of merchandise, 53 tons as compared with 11 tons in British machines. The British service showed a high efficiency as 93 per cent of the flights made during April-September were completed within 4 hours, as compared with 82 per cent being completed within 4 hours in 1920.

Accident Statistics

The number of accidents has been encouragingly small; for each flying accident during the 29 months from May, 1919, to September, 1921, the average number of machine-miles flown was 33,000; of the 142,241 passengers carried, 12 were killed and 17 injured. The rate for the six months ended Sept. 30, 1921, was less, and only one passenger was killed and one injured during that period.

During the 12 months ending Sept. 30, 1921, imports into the United Kingdom were carried by air to the value of £512,060 and the value of exports (including re-exports) was £278,131; the bulk of the goods were carried between this country and France, but the major portion of them on other than British machines.

Automotive Market in Argentina

Keen competition requires study of local problems. Service vitally important. The writer, engaged in selling in the Argentine, gives his opinion about choosing representatives and offers suggestions to American manufacturers as to method of procedure necessary for sales success.

THAT the American manufacturer of motor cars, trucks, accessories or tires may fully understand the market of Argentina, he must realize at the outset that Buenos Aires is the most difficult and intensely cultivated market for any kind of product, whether automotive, dry goods or perfume. As the South American seems to believe that New York is the center of the United States, so the citizens of other countries believe that in South America all things commercial center around Buenos Aires. Hence the manufacturer selling goods in South America concentrates on this city.

This concentration of effort brings the merchants of Europe and the United States into keen competition. Unheard of sacrifices as to terms and prices are sometimes made, and the Argentine is a close buyer, very experienced in dealing with merchants of other countries.

There is very little manufacturing done in Argentina. In some cases, however, local factories have attempted to imitate American products, such as lamps and small parts. The few repair shops that do exist are equipped, in many instances, with American machinery. There is one large manufacturer of storage batteries located at Buenos Aires, known as the Fabrica Nacional de Acumuladores, the product called "Nacional," of good quality and giving satisfactory service. This firm purchases many of its parts in the United States.

To sell motor cars in Argentina, one should know something of its geographical situation. It is a vast country with many good roads and several very large cities in the interior. There are three principal ports of entrance, Buenos Aires, the largest; Rosario, situated on the Parana River, capable of accommodating vessels of 18,000 tons and over, and where the banks of the river are so situated that ships unload on the land without the aid of wharves; and further south lies the port of Bahia Blanca.

Many hundreds of miles southward, in Patagonia, other ports are found, giving entrance to the sheep raising country and the great oil fields of Rivadavia. At the foot of South America lies the important port of Punta Arenas, which is open about six months out of the year. This port handles the sheep raising country, where motor trucks are greatly needed for the transportation of wool, as there are no rivers large enough for that purpose in that section of the country.

There are two important factors to be considered in conjunction with selling cars in the Argentine. They are:

(1) To send out the right sort of man for the work,
(2) To select the proper kind of representation without putting too much stress on credit reports.

American manufacturers are prone to forget that it costs many times more to travel and do business in South America than it does in the United States. To be successful, a man must know the people and have some knowledge of Spanish, which he can pick up quickly if he keeps away from English-speaking people as much as possible. The manufacturer will find it advisable to send out an experienced man, for he will secure better results and be able to get in touch with influential people.

Too often manufacturers close contracts with foreigners on the strength of fine words and a large letter of credit. This type of person may even have letters of introduction from influential people and officials and give an initial order for ten or more cars.

It is better not to depend wholly on these favorable signs, but before closing a contract to spend $50 on cables to ascertain whether the prospective dealer runs a repair shop; what standing he has in the community; whether he has ever refused a draft drawn on him by an American firm, without a cause which can be considered honest, or whether he has taken advantage of exchange conditions, as many have during the past year, and refused to accept shipments.

No manufacturer should give any firm an agency that is not willing to place an order for at least two of each model of cars. In instances where a factory makes but two models, the initial order should be for not less than six cars, and in every case 20 per cent of the purchase price should be spent for repair parts. Service must be given and it cannot be given unless the dealer is prepared to furnish repair parts.

It is a mistake to give an agency to any firm not equipped with a "taller" or repair shop. A firm in Buenos Aires, for instance, handling one of the leading American cars, once took the position that they did not wish to see the car after it left the salesroom. This firm was worth $1,000,000, but it had no repair shop. To-day it is out of business, as might be expected. If service is not given, the resale is apt to be lost to a concern that does give service.

The vast size of Argentina has an important bearing upon the type and number of agencies a manufacturer will need to market his product most efficiently. There are over 8½ million people in the country. In the city of Buenos Aires there are 1,750,000. There are five cities outside of Buenos Aires with populations of over 60,000, and each an important point of distribution; Bahia Blanca, a seaport city of 348,000 inhabitants, located on the south shore; La Plata, thirty miles from Buenos Aires, where some of the largest packing plants are located. Many ships load freight and take on passengers here and it is a noted university city; Rosario has 222,600 people and is a shipping point for a vast province; Tucuman is the center of the sugar industry; Mendoza, while it has only 50,000 inhabitants, is the center of the wine country, very wealthy and at the foot-

hills of the Andes through which the Transandine road passes over the mountains into Chile. Sante Fe and Cordoba, a favorite summer resort in the foothills of the Andes, are both important cities.

An American motor car builder making a contract with a Buenos Aires dealer who wishes the entire Argentine as territory should so word the contract that the dealer will be obliged to place sub-dealers in the principal cities, that if this part of the contract is not carried out, the manufacturer will have the right to go after the business in the neglected provinces himself, giving the Buenos Aires dealer the commissions due him.

Advertising as an aid to Argentine dealers has been neglected by American manufacturers. Manufacturers must learn to give the same advertising aid that they do in their own country in order to develop business.

Successful advertising requires that the medium used be written in the language of the country. The biggest part of all cars entering the port of Buenos Aires are sent inland for distribution, and advertising matter must also go inland to bear results. The type of advertising used in the United States cannot be applied to local conditions in the Argentine.

Federal Income Tax Amortization

THE new Federal Income Tax Law provides for a reasonable deduction for the amortization of buildings, machinery, equipment or other facilities constructed, installed or acquired on or after April 6, 1917, for the production of articles contributing to the prosecution of the war against Germany.

A recent compilation of this law with relation to amortization has been made by Mr. T. W. Dinlocker, assistant comptroller, S. K. F Industries, Inc., and the most important features of the law are well worth studying now, as claims cannot be filed later than March 15, 1922.

Mr. Dinlocker states that:

"Under the law, amortization is permitted in case buildings, machinery, equipment or other facilities were constructed, erected, installed or acquired on or after April 6, 1917, for the production of articles contributing to the prosecution of the war. Reference to the Revenue Act of 1918 makes it clear that the differentiation between those industries to which amortization shall or shall not apply is as between essentials and nonessentials. The fact that any industry was allowed to operate under priority is evidence sufficient of its essential character. It is not necessary that the product was sold to the Government, nor even to Government contractors, to bring the manufacturer of essentials within the rule."

"Under the regulations amortization is divided into two distinct classes, the first known as Class I, dealing entirely with buildings, machinery and equipment which have been already discarded or will be at a known date previous to March 3, 1924. The second, or Class II, deals with buildings, machinery and equipment which have and will undoubtedly continue to have a certain value in use to the taxpayer in his going business."

"Class I amortization is relatively simple to determine. This covers buildings, machinery and equipment that have been discarded or will be discarded at a known date. Class II, the more difficult of determination, covers property which still has and probably will continue to have a value in use in the going business, when the useful value is not to be taken at less than the salvage value. Salvage value was ruled to be the value ruling during the first part of 1919, but this value is abnormally high; later interpretation and application of the law and regulations has become more reasonable and liberal."

"In support of all amortization claims, it is necessary to submit a statement showing the calculation of amortization in the following form:

A —Description of property.
B-1—Date of acquirement or date when construction, erection or installation was begun.
B-2—Date on which construction, erection or installation was completed for operation.
C —Reference or Voucher Number.

TOTAL COST

D-1—Expended prior to April 6, 1917.
D-2—Total subsequent to April 6, 1917.
D-3—Depreciation or losses sustained prior to Jan. 1, 1918.
D-4—Depreciated cost on which amortization is based (D-2) less (D-3).

RESIDUAL VALUE

E-1—Apportioned to period prior to April 6, 1917.

APPORTIONED TO PERIOD SUBSEQUENT TO APRIL 6, 1917

E-2—Estimated value in use in going business.
E-3—If property has been sold, amount received.
E-4—If property has been discarded, estimated salvage value.

Amount to be amortized (D-4) less (E-2), (E-3) or (E-4)

Roads and Dollars

REPORTS which have reached the President's Conference on Unemployment since Jan. 1 indicate that highway construction in the various states will provide work for 200,000 men during 1922.

Under the provisions of the Federal Highway Act, 30 states have informed the office of Col. Arthur Woods, chairman of the Emergency Committee in Washington, that plans are under way to build 6261 miles of good roads.

This act was one of the recommendations of the conference as an emergency measure to provide jobs for the nation's unemployed. A fund of $75,000,000 was created, to be apportioned among the states taking advantage of the act, each State to have its own allotment for road construction matched by a similar amount from the Federal Government.

Estimates by governors show that $40,000 will be the average amount per mile expended. When the work is approved by Federal inspectors, the State will receive from the United States about $20,000 per mile.

"The Federal Highway Act," said Colonel Woods, "ought to result in a large extension of good roads mileage throughout the country. At the same time it is helping to solve the unemployment problem until our various industries pass through the present crisis and take up the slack that puts every willing worker in the country back on the payroll. In addition, the taxpayer will benefit, as well as his unemployed neighbor, by the opening up of new districts and the improvement of existing highways."

Relationship of Bus Transportation to Electric Railways

Need for a better understanding as to the merits of each method of transportation is apparent. In this article is shown the attitude of the electric railway companies toward bus transportation as clearly evidenced in the recent semi-annual meeting of the American Electric Railway Association.

By Harlow Hyde

THE undercurrent if not the main theme of the semi-annual meeting of the American Electric Railway Association, held in Indianapolis recently, was to the effect that co-ordination of all trackless transportation is necessary, and that the co-ordinating must be planned and carried out by the electric railways and the interurban lines. The morning session was given over entirely to this discussion in papers presented by C. D. Emmons, president of the United Railways and Electric Company of Baltimore, Md.; E. B. Whitman, member of the Maryland Public Service Commission; Paul Shoup, president of the Pacific Electric Company of San Francisco, and Harry Reid, president of the Interstate Public Service Company (interurban) of Indianapolis. Three of these papers voiced the view that there must be co-ordination of street and highway electric transportation and of buses, jitneys and trucks, and that "urban and interurban transportation is a natural monopoly and that the public will best be served where the needs of a particular city or community are met by a united system."

Mr. Emmons, who had made a study of London bus transportation and of the transportation phases of other British cities, together with the tubes and trams, presented facts as well as conclusions which the truck and bus manufacturer, as well as their sales departments and organizations, might study to advantage. He shows that during the normal hours buses are very popular in London, carrying 30 per cent of the total. While the underground and inter-suburban railways carry 40 per cent, trams haul about 30 per cent of the total. The amount of trackage in cities in the British Isles is far below that found in American cities. One mile of track to every 6000 people represents the largest trackage of any of the British cities cited. He states that the trackage varies from one mile to every 1500 people to one for every 2500.

In another portion of his paper Mr. Emmons makes the statement that, "There is probably not a city in the United States that would not have a different layout and distribution if it were laid out anew to fit conditions as they now exist, resulting in much less mileage to operate and the ability to give better service to the car rider." In light of the street car companies' demands that they have the right to earn "6 per cent" dividends, and their constant fight to abolish jitneys and buses if they are not co-ordinated by the street car lines, this is enlightening. Electric railway revenue difficulties enter into almost every fight against buses, and have been one of the main sources of restriction in this growth.

Mr. Emmons' paper has this statement: "In many places these jitneys and even operators of buses of a higher type of transportation than that given by the so-called jitneys themselves have been permitted to operate in such a piratical manner that they actually steal from the established transportation company—whose aim is to give all-round city service—sufficient to continue an existence, and at the same time to cause a starved condition of the transportation system." His final conclusion is that "in American cities a complete, comprehensive and satisfactory transportation system at a minimum cost can only be secured by means of control of all city transportation agencies in the hands of one management." His proposals, if adopted, would abolish jitneys and buses, unless the electric railway lines could control and operate them.

Even more in favor of this sort of control was Ezra B. Whitman, Public Service Commissioner of Maryland. He began with this statement: "It is probably not necessary for me to argue before you gentlemen that urban transportation is a natural monopoly, and that the public will be served best where the transportation needs of the particular city or community are met by a unified system." That this is not the only attitude of some electric systems toward buses may be gleaned from a later statement of fact that appeared in his address.

Speaking of the fight against the jitneys and the buses in Baltimore he said:

> **The street railway company, fighting fire with fire, or rather buses with buses, started a competing line on Charles Street, and when the independent line had been forced to retire from the field, sought permission to discontinue the service. This permission the commission refused to give, although according to the figures submitted by the company the line had been operated at a loss. It is evident from this that the bus or truck maker cannot consistently count upon the "co-ordination" of buses and other trackless transportation that the electric companies urge. In this case there was a deliberate attempt to blot out the bus lines.**

That the truck maker can expect a similar antagonistic attitude from the interurbans can be gathered from the paper of Harry Reid of Indianapolis, president of the Interstate Public Service Company (interurban). His entire paper would be more than worth reading by every truck maker and sales department of commercial vehicles. Mr. Reid said: "Probably many of you know that I am opposed to these transportation agencies as competitors of the electric railway interurban, and that I feel they should be disposed of by legislation which would result in the regulation of their business by the

Public Service Commission or by some other agencies, on the same theory that two electric or two water companies are not allowed to operate in competition . . . **believing that our interurban business, to be successful, must operate as a natural monopoly, the same as any other class of utility service."** As interurban forerunners Mr. Reid thinks that trucks and buses may be of service in opening up new territory that may later be tapped by the interurban. He would have the interurban use the truck or bus extensions as feeders to see if there were sufficient business in the territory to warrant extension of the tracks. In the light of his paper it would seem that he considers that the whole State, or even larger territories, form the basis of "the natural monopoly" of the interurban lines. He would have no truck lines or buses as feeders or extensions unless the interurban felt like putting them in. Meantime the makers would await the pleasure of interurban company leisure.

A little study of local motor transportation history, regulation, taxation and licensing will show the truck and motor vehicle maker that here at least the electric companies do not need the urging that was prominent at the meeting to the effect that all these electric companies and men get into politics. One of the officers of an Indiana interurban company (G. K. Jeffries, general superintendent of the Terre Haute, Indianapolis and Eastern Traction Company) has been for several years president of the Hoosier State Automobile Club. This club has taken a prominent part in motor vehicle legislation in the State, the club boasting of its success in getting the bills drawn up by it through the legislature. Among these bills is one that places the truck license fee near to the proposed Uniform Motor Vehicle Law fees, while the passenger car is assessed at about one-half of the rates that would be established by that fair rate. Another fact worth the truck makers' note is that Indiana has lagged behind to an almost unique degree in the making of hard-surface State roads. The gravel roads break down in the spring and right now trucks have to be kept off many of the main trunk lines.

Tractors on Southeastern Farms

A STUDY of the reports of 684 tractor owners in Alabama, Georgia, North Carolina, South Carolina and Tennessee which has just been completed by the Division of Agricultural Engineering, United States Department of Agriculture. The reports were made in March, 1921, and at that time 86 per cent of the number reporting believed that their machines would turn out to be profitable investments and 90 per cent stated that they intended to use them during the ensuing year.

It must be remembered, however, that most of the owners of these tractors were operating farms considerably larger than the average. Of the 684 farms, the average size was 290 acres, while according to the 1920 census of agriculture the average size of all farms in these States was only about 75 acres. Over 90 per cent of the farms reporting are more than 75 acres in size. There is no great difference between the crops raised on the farms where tractors are owned and on those where tractors are not owned.

The 2-plow tractor is evidently the size best suited to the needs of most of these farms. Seventy-six per cent of the 684 machines are of this size, and about 66 per cent of the men reporting now believe that this size is the best for their conditions.

All of the men whose reports were used in this study purchased their tractors between March, 1918, and September, 1920. The average first cost of the machines was $1,050, and the average of the owners' estimates of their useful life was 7.6 years. On this basis the annual depreciation charge is $138 per year.

Each owner was asked the number of total days' work done per year with his tractor, and the average of the replies was 53 days. The 2-plow tractors were used an average of 52 days per year and 3-plow tractors 56 days.

About 80 per cent of these men used disk plows with their tractors. The average acres covered per day with the 2- and 3-bottom disk and moldboard plows drawn by these tractors is as follows:

2-plow disk	4.7 acres	2-plow moldboard	5.3 acres
3-plow disk	6.5 acres	3-plow moldboard	7.3 acres

Over 90 per cent of these men stated that the quality of the plowing done with their tractors was better than that which they formerly did with horses or mules. The tractors drawing disk plows used on an average about 3½ gallons of fuel per acre for plowing, and those drawing moldboard plows about 3 gallons per acre. This difference between the fuel required when using disk and moldboard plows is due largely to the fact that the disk plows are narrower than the moldboard plows, and the acreage covered per day is correspondingly less.

The average cost (including charges for depreciation, interest, repairs, fuel and oil) per acre of using the 2-plow tractors for plowing in 1920 was $2.07 when using gasoline and $1.73 when using kerosene. For the 3-plow tractors it was $1.90 when using gasoline and $1.59 when using kerosene. These costs are based on 31-cent gasoline, 20-cent kerosene and 85-cent lubricating oil, the average prices which these farmers paid during 1920. The repair costs were computed on the basis of an annual repair charge of 4 per cent of the first cost of the machines and interest charged at 8 per cent on the average investment.

On account of the smaller acreage covered per day, and the greater amount of fuel used per acre, the cost of plowing with the disk plows was somewhat greater than was the cost when using moldboard plows.

Each farmer was asked how many days of man labor his tractor saved annually and the average of the replies was 66 days. The average of the replies of the owners of the 2-plow tractors was 63 days and of the 3-plow machines 78 days.

Nearly 50 per cent of the men reporting have increased the size of their farms since purchasing their tractors by an average of about 50 acres—from about 210 to 260 acres. At the same time they have decreased their workstock from an average of 6.7 head to 5.1 head. They kept an average of one head of workstock for each 31 acres before they purchased their tractors, and were keeping one head for every 50 acres at the time they reported.

The men who did not increase the size of their farms reduced their workstock from an average of 8.8 head to 7.4 head after the purchase of their tractors. Nearly half of the men, however, who were still farming the same acreage had made no reduction in their workstock.

A comparison of the reports of the men who were satisfied with their tractors with those who were dissatisfied showed that in some cases the failure to take advantage of the opportunity offered by the tractors to increase the acreage and reduce the workstock was probably responsible for the dissatisfaction; in other cases the poor service rendered by the tractor was responsible, and experience has shown nearly one-half of the dissatisfied owners that their tractors are not the proper size for their farms.

Front Wheel Driving

Editor, AUTOMOTIVE INDUSTRIES:

I differ in several respects with the "Front Wheel Drive" editorial in the Sept. 15 issue of the AUTOMOTIVE INDUSTRIES.

It is true that there has been renewed activity in connection with front wheel drive automobiles and commercial cars, and it is well that this is so, because the advantages claimed for this particular drive in a good many instances make it superior to the rear wheel drive now in almost universal use.

In the second paragraph of the editorial the possibility of using a low-hung platform and body is treated in such a way as to make it appear that this is the most important advantage gained by employing front drive, whether it be through the bent rear axle or by some other means. The uses cited give but little idea of the possibilities in any and all industries. So far as the possibilities of a low-hung body are concerned, this can be realized on the rear driven car almost as well as on the front driven car, but possibly not quite to the extent as with front drive.

In regard to the disadvantage of a low-hung body in that it brings the passenger closer to the dust of the road, it may be said that the 6 or 8 in. that the body could possibly be lowered as compared with the body of a rear driven car is unimportant. I believe that passenger cars, particularly, are low-hung enough in present constructions so that a front drive automobile could be built almost identical with a rear driven car without interfering with the style of bodies used at the present time, hence dust as well as road conditions would remain the same for both.

Also, in order that the body may be low-hung, it is not at all necessary to crank the rear axle, as the body accommodations are very similar to those of the rear driven car, though possibly 4 in. or 6 in. at the most can be gained by lowering the body without greatly interfering with the seating arrangements. Neither will the front seat suffer; its capacity and comfort are just as great as in the present-day automobile. The rear seat can be made much more comfortable. Both seats can be made deeper and provided with softer cushions, as is the case with present-day cars.

It is also plain that the location of the driving axle under the front end greatly favors the spring suspension. There will be less jerking when the car starts and stops. On the present-day car or truck, whether the drive is of the Hotchkiss type or whether torque tubes and arms are used, the tendency of a car is to lift or draw, and unless cushioning is excellent and the back of the rear seat is well upholstered it may become rather uncomfortable after a certain length of time on the road. This, however, is not true of the front driven car for reasons explained above. The spring need be only for suspension and not for driving; consequently, the action can be much softer.

As regards the efficiency of transmission, it can easily be shown to be greater in the front drive automobile than in the rear driven one. Reductions are different, the number of gears in mesh are different, the connections are less in number, moving parts operate at less disadvantage and bearing applications can be simplified. Two bearings necessary when propeller shafts are used can be eliminated. It has been demonstrated that it is much easier to pull a vehicle around a corner than to push it. On a front wheel drive automobile the power-driven wheels are turned in the direction one chooses to drive. In a rear driven car turning is accomplished by swinging the front wheels around. They will then encounter increased resistance in the direction they have been traveling and proceed in the direction of least resistance. At the same time the rear axle, while tending to drive straight, differentiates between the speed of the inner and outer wheel, being forced to draw a larger circle with one wheel than with another.

On a front wheel drive the exact opposite occurs, assuming that the front axle of a front drive automobile is the same as the rear axle of a rear driven car. The power is transmitted through the bevel gears and divided between the two wheels by means of the axle shafts. It is true that the inner wheel will describe a smaller circle than the outer one; nevertheless, friction between ground and tire is not used to steer the vehicle, for the differential itself takes care of the speed variation around a curve and drives to wheels accordingly, instead of forcing them to make different speeds, due to the fact that the front wheels have been set at an angle, which necessitates deviation from a straight line.

It is not necessary to dwell much upon the natural tendencies of a front wheel drive to get out of depressions and raise itself over obstacles. While a rear driven car is forced to go into holes and out of holes, the front wheels are pushed against the far wall of the depressions instead of tending to climb over them.

Regarding the universal joint connections under pivot pins of the steering axle of a front drive automobile, it is only necessary that engineers provide mechanism of some kind which will take care of the differential motion of a joint at different angles and that angular speed variations, if not entirely eliminated, at least be reduced to a minimum. Also, it is up to the engineers to see that propeller shafts or universal joints are made in such size, of such quality and of such dimensions that they will withstand all the necessary punishment given them in service on a front drive car.

The author appreciates the difficulty of finding room for both the engine and the transmission in the limited space above the front axle or under the hood. However, the rear driven car with its body, hood, dash, fenders and with its entire outward appearance is not necessarily the ultimate automobile. New ideas and designs that upset old-established standards are coming through every day, and it is not necessarily true that the hood, body, dash, seats and fenders of an automobile must be as they are made to-day and cannot be changed to accommodate possibilities that are offered by a newer construction. If there is no space above the front axle, space can be made behind it. If present-day hoods are

not long enough, they can be made longer, and some day bodies may be more beautiful, more useful and more desirable than present-day bodies. In other words, the complete outward appearance of the car may undergo change if this is necessary to admit of a better mechanical construction. We have to-day ahead of us a period of improvement in which we shall see many new things develop and become successful. We should hesitate to attempt to wipe off possibilities of a construction that has never been given the opportunity to prove itself, but which construction is bound to receive attention from many quarters in the automotive industries.

O. E. SZEKELY.

Tractor Wheel Cleats

Editor, AUTOMOTIVE INDUSTRIES:

I notice that with the exception of Fordson and Allis-Chalmers, practically all the tractor engine wheels have the cleats slant with the inner edge forward, that is the end of the cleats next to the machine touches the ground first, while with the Fordson the outer end is forward and touches the ground first.

I wish to know if there is any special reason for this arrangement. It would seem that, taking into consideration the sidewise thrust due to the angle of cleat, the wheels should crowd together instead of spreading them apart as it would be with the Fordson. For instance, on sidling places on the down hill wheel the cleats should be arranged so the thrust would be up hill and prevent the tractor from slipping down hill.

I am interested in a four wheel drive tractor development in which this thrust due to angle of cleats is a feature and would like to have any data you can furnish along this line. Is there a treatise on cleats and their action under various conditions that you could refer me to?

J. N. P.

When the cleat is so slanted that the inner end touches the ground first there is a tendency for the wheels to be forced together on the ground by the reaction between the ground and the clear, as the torque impressed upon the driving wheel tends to cause that wheel to slip. Of course, thrust washers can be provided on the outside of the wheel hub or on the inside of the wheel hub, and it would therefore seem to make little difference whether the cleats were applied one way or the other. However, since the weight supported by the driving wheels has a tendency to make them spread at the bottom, it would probably be preferable to so arrange the cleats that the reaction of the ground on the cleats forces the wheels together, as in that case the two effects would partly neutralize each other.

On side hills, if it is desired to overcome the tendency of the wheels to slide down the hill, it is necessary to have the cleats on all wheels turned so that the uphill side of the cleat meets the ground first.

So far as we know there has been no treatise published on the subject of cleats for tractor wheels.—EDITOR.

Paint Standards Needed

Editor, AUTOMOTIVE INDUSTRIES:

It has often occurred to me that the S.A.E. should take steps toward standardizing automobile painting materials and operations seem to point to this as a logical solution of the factory's problems. By this I do not mean that the different materials should be standardized by formulæ or chemical properties, but rather by their physical properties.

To illustrate: the three important properties of a primer are—penetration, drying rate and elasticity of the dried film; of a filling and surfacing material—body, drying rate and texture of rubbing varnishes—drying rate, working qualities and hardness of the dried film; and of finishing varnishes—drying rate, working and flowing qualities and elasticity of the dried film. From all of which you can see that simple tests will reveal what materials are best adapted for certain purposes without any concern as to the chemical make-up of the material—by that I mean an axact knowledge of just how it was made. This would be the first step to take in order to set the house in order. With this done every factory, job shop and painter would have reliable S.A.E. ratings upon which they could depend.

With such information at hand a number of standard jobs could be laid out and their durability accurately determined. The combination of operations will vary, of course, just as other production methods vary, but maximum and minimum durability could be determined, and this alone would serve a very useful purpose.

With such data available automobile factories could test their paints just as they are now testing their steels, etc., and definite data could be furnished the paint departments that would do away with a lot of the unsatisfactory work that reaches the dealer and has to be done over. This would automatically cause the paint makers to put their houses in order and would react for the good of the entire trade.

CHICAGO COLLEGE OF AUTO PAINTING,
G. K. Franklin.

Review of Recent Publications

A BOOK entitled "Service Station Managament," by Charles L. Jones, has just been published by D. Van Nostrand Company.

In the words of the author, the book was written with three definite ideas in mind, as follows:

1. To assist the man just entering the automobile field.
2. To assist automobile dealers and service stations.
3. To serve as a guide to the chief clerk, superintendent, service manager, shop foreman and stock man.

To those who are studying methods of labor charges, Mr. Jones's remark on Flat Rate will be of interest. He says: "Flat rate charges, if computed on the proper basis, are the most satisfactory to dealers, and at the same time a protection to customers."

While the book applies directly to Ford service stations, there are many things dealing with merchandising service, such as management, layouts and systems, which will be found of value to all who are making a study of the problem of service.

A NEW edition of the Export Trade Directory, compiled by B. Olney Hough, editor of the American Exporter, has just come off the press of the Johnston Export Publishing Co. This large volume, as its name implies, is a trade directory of firms engaged in the export and import trade. Information concerning the company, its foreign connections, the lines it handles and in many instances credit ratings are given, listing nearly 2500 concerns. Other departments give the branch houses in the United States of foreign firms, bankers engaged in foreign transactions, freight forwarders, steamship lines, marine insurance companies and brokers, export packing and trucking companies, foreign consuls in the United States and American consuls abroad.

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Sales Information

FROM the standpoint of good business management, much valuable material is neglected when the reason for the loss of a sale to a direct competitor is not secured and properly recorded. The immediate object of every retailer is to get the maximum number of sales possible in his territory and to do this he must understand the reasons for his failures as well as his successes. Ofttimes more can be learned from the former than from the latter.

Material of this nature must originate with the salesman and pass through the retailer to the distributor and ultimately to the manufacturer. In this way each unit of the selling organization may secure the specific information applicable to it. While this material may seem to deal strictly with the retail selling problem, it is nevertheless of importance to the manufacturer for three reasons, as follows: It would

1. Furnish a consensus of opinion on the product itself.

2. Tend to build up a strong, understanding selling organization.

3. Throw some light on the used car situation.

The average automobile salesman loses all interest as soon as the sale goes against him and is closed by a competitor. He makes no effort to learn why the sale went against him, believing that he learned the reasons while fighting for it. But this is not quite true, because ofttimes the purchaser is not willing to express himself freely until the sale is made.

The desire to know why a sale is lost can be fostered by the factory and if properly done should yield much information of value.

Hot and Cold

A LITTLE gathering was held the other night by representatives of the automotive industry to impress upon certain editorial molders of public opinion the great utility of the motor vehicle, its transportation efficiency, and its usefulness in the business and personal life of the nation. The passing of the "pleasure car" idea, the true utility function of the passenger car, and the utterly unjust nature of much of the taxation and proposed taxation directed against the motor vehicle were truthfully and ably presented

"All was quiet along the Potomac" until one journalist accepted the invitation to discussion and said something like this:

"Whatever general public opinion prevails in regarding the automobile as a pleasure or luxury vehicle is due chiefly to the car manufacturers themselves. We editors can never hope to mold public opinion to see the utility and transportation value of the automobile, so long as the manufacturers continue to contradict the editorial pages in almost every line of advertising copy which they write. Nearly every car advertisement stresses the luxury phases of the vehicle; the advertisements appear largely in those mediums which appeal to the luxury or amusement phases of life. The whole atmosphere that is thrown around 95 per cent of car advertising is that of pleasure, amusement, luxury, etc. Writers can not be expected to put over this new psychology of utility when those making the car forcibly and continually contradict them on the advertising pages of their publications."

The thought expressed is by no means a new one, but it is worth repeating. Its truth is not realized, apparently, in many parts of the industry. As the car market becomes more and more a replacement market, the proportion of "car-wise" buyers increases. The automobile serves a real utility function in modern life; its numbers grow because the vehicle serves a transportation need. Utility is the basis of its success.

Intelligent utility advertising is good merchandising; it is good business; it is fundamentally sound. And that is the reason for the emphasis upon the utility phase of the automobile. That phase should be emphasized because it is basic. The statement that the automobile is primarily a utility vehicle is

true and, by the same token, it is true that a large proportion of cars used are bought and used for utility or semi-utility purposes. This fact should be completely recognized.

Comparing the average car advertisement with the statements made before Congressional tax committees, it would seem that there was some difference between the facts and the statements. There is not.

Thinking Rightly

ONCE in a while some really constructive thought shines out from the mass of publicity and promotion material that reaches us daily. We received one of these gleams the other day in a bit of promotion material from the S. A. E. It was all interesting, but one paragraph is so pertinent to the solution of most of the problems confronting the automotive industry to-day that it is worth special attention.

"We must think rightly before we can act rightly. It has been observed that it is far easier to confuse human reason than the laws of gravity. The problems before us are bigger than any one man's head.

"It has been enunciated that at the root of our refusal to think things out in advance, to arrange concisely the forces adequate to attain a clearly conceived end is a sort of half belief and half feeling that it does not pay to think things out. Moreover, thinking is hard work, not to speak of formulating and executing sound plans for carrying out those things which proper study indicates should be carried out."

The longest way 'round is often the shortest way there. Actions based upon fundamentally correct reasoning are certain to bring success. Thorough analysis and thoughtful experimentation are essential to the proper solution of the marketing, engineering and production problems of the industry.

The Best Battery Location

IN what part of a passenger car chassis should the storage battery be located? A satisfactory compartment is usually provided in the modern chassis, but it is not always so placed as to be easily reached by the person who must fill the battery, and it is frequently difficult to remove the battery for repairs or recharging. Perhaps the most usual location is under the floor boards of the driver's compartment and near the right side of the frame of the car. This location avoids interference, in the case of left drive cars, with the clutch and brake control rods, but is apt to be too close to the exhaust pipe to prevent rapid evaporation of water in the electrolite unless some heat insulation is employed. Furthermore, it may interfere with the controls in the case of right-hand drive, which is often required on cars intended for export, and it involves raising the floor boards or a section of them when access to the battery is required, and this is apt to be a dirty and somewhat inconvenient operation which is postponed or often neglected by the user, who might be inclined to fill the battery more often if it were more accessible.

From the manufacturer's standpoint it is desirable to so place the battery compartment that it is easily reached regardless of the type of body furnished, since varying the location involves certain complications which are undesirable in quantity production. The life of the battery is increased by a location which minimizes the amount of jarring and vibration which the battery receives. Weight distribution is another element sometimes considered.

A battery placed under the driver's seat can often be made quite accessible, but this location also has some disadvantages, as, indeed, have nearly all locations in common use. The problem is somewhat different in the case of different types of bodies and different sizes of chassis, but there probably are one or two "best possible" arrangements which can be used in nearly all cases. The Forum of AUTOMOTIVE INDUSTRIES is open to engineers and others who have pertinent views to express in this regard.

Efficient Handling of Parts

WE have heard recently a great deal of discussion regarding the wastes of industry. It would, in many cases, be a revelation to go through automobile retailers' stock rooms. Here, unknown to the manufacturer and even to the retailer himself, exists a vast amount of inefficiency and resultant loss.

The underlying reason for this inefficient handling of parts is the lack of an appreciation of its importance. We doubt if a proper incentive is given for men to become experts in this field, with the result that the ambitious man who looks to the future enters the fields of production or selling at the first opportunity.

It may not seem necessary to the manufacturer to oversee the handling of parts as he would the selling organization, but such an action would be distinctly to his advantage as well as to that of the retailer. Some of the benefits to be derived from this procedure if properly conducted would be as follows. It would:

1. Enable the retailer to avoid tying up capital by stocking a minimum of parts.
2. Facilitate dealing with customers through accurate records.
3. Avoid tying up customers' cars through lack of replacement parts.
4. Facilitate the taking of inventories with proper writing off at frequent intervals.
5. Enable the retailer to determine his profit or loss on this part of his business.

It is not meant that there should be any heavy hand resting on the retailer, for it is desirable to give the greatest amount of freedom possible to the individual. What should be given is co-operation, and more specifically any analysis work on the proper method of handling parts which the factory is able to furnish. Assistance should be lent in establishing a system which would be applicable to the particular size of plant under discussion; a system which would operate in harmony with the factory.

Retailers who have this co-operation extended to them cannot help but be better representatives, and the result will have a far-reaching effect on the success of the selling organization.

Washington Sees New $348 "Star"

Will Be in Quantity Production by June

Durant Responsibility Ends With Completed Car—Separate Distributing Company

NEW YORK, March 9—The new low-priced car, to compete with Ford, which will be manufactured on contract by Durant Motors, Inc., will be in quantity production by June 1, it was announced to-day. It will be turned out temporarily at the Long Island City plant of Durant Motors of New York, and the permanent factory site has not been determined. The first showing of the car, which will be called the Star, was given to-day in the salesroom of Harper Brothers on Connecticut Avenue in Washington.

The distribution, sale and servicing of the car in the United States and its possessions will be in the hands of the Star Motor Car Co., which will be independently operated and financed. Details regarding the stockholders in this company are not yet available. While it is understood to have been the original intention that parts companies which supplied units for the new car would be given an opportunity to take stock, it now is stated positively that these interests will not be connected in a financial way either with its production or distribution.

Among those who accompanied W. C. Durant to Washington for the unveiling were R. W. Judson, president of the Continental Motors Corp.; A. R. Demory, president of the Timken-Detroit Axle Co.; C. B. Hayes, president of the Hayes Wheel Co., and Harry T. Dunn, president of the Fisk Rubber Co. Others in the party were F. W. Warner, former general manager of the Oakland Motor Car Co. and several executives of the Durant companies.

The responsibility of Durant Motors for the new line will end when the completed vehicles are turned out of the factory. No steps have been taken as yet towards the formation of a distributing organization, but it is understood that no exclusive territory rights will be given for the sale of the car. The sales policy will be practically identical with that established by Ford.

Detailed specifications have not been made public. The car will be powered with a Red Seal Continental engine, and it will have a conventional automobile chassis plus the Durant tubular backbone. The Hotchkiss drive is through semi-elliptic springs and the propeller shaft has Spicer universals. The transmission will provide three speeds forward and reverse.

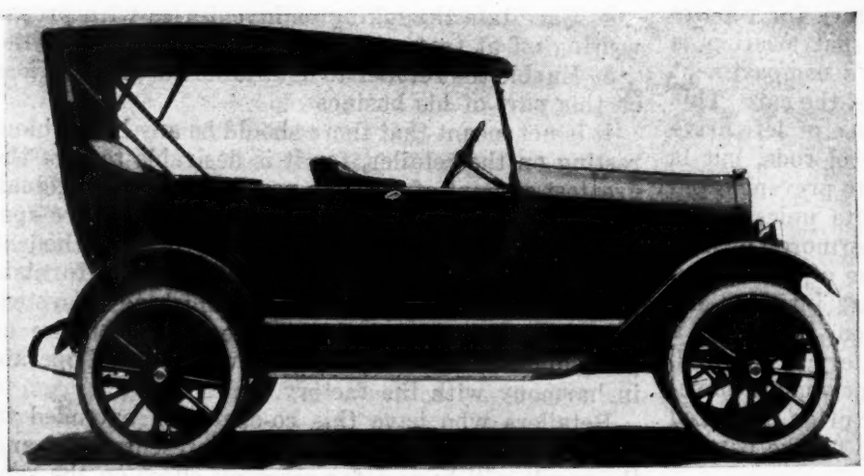
Timken axles will be used and Timken bearings front and rear. Internal and external brakes operate on the rear wheels. The gasoline tank will be located on the rear, and the Stewart vacuum tank system will be used.

There will be a one-man top with a sliding windshield. A disk clutch will be used. The wheelbase will be slightly longer than that used by Ford.

Standard parts of high grade will be used throughout and the car will have the accessibility of the Durant models, which, it is claimed, will make service easy and not expensive.

Much remains to be told of the plans for the manufacture and sale of the car,

(*Continued on page* 590)



"Star," which will compete with Ford in price

Output in February Gains Over January

Schedules of Car and Truck Manufacturers Increased During Present Month

By JAMES DALTON

NEW YORK, March 7—With the coming of March, production schedules of most passenger car and truck manufacturing companies have been materially increased. While accurate figures for the aggregate February output are not yet available, it was considerably larger than for January. Total production of cars and trucks the first month of the year was 90,486 as compared with 78,995 for December. Eliminating Ford, the gain for January was 40 per cent on passenger cars and 38 per cent on trucks. The increase was largely in the lower price classes.

Parts Business Increases

Business in steadily increasing volume is coming to the parts and accessory manufacturers as the vehicle makers give unexpectedly early releases on materials to take care of expanding business. Sales in January exceeded January of last year by approximately 200 per cent. It is probable the excess for February was fully as large compared with the same month last year.

Manufacturers, especially in the Detroit district, are professing enthusiasm over the outlook, and the same is true of dealers in all parts of the country. Wherever shows have been held the attendance has been record-breaking, evidencing the interest of the public in motor cars. Dealers have booked many live prospects, and the actual sales at retail have been far ahead of last year.

Prices on passenger cars apparently have been stabilized for some time to come. Most manufacturers have brought their selling prices as low as they can go until further cuts can be made in production costs. There is no immediate prospect of lower material prices. Revival of demand in the truck field is leading to price recessions by makers who have not made reductions recently and some sharp cuts have been made.

(*Continued on page* 591)

Templar Syndicate Will Handle Claims

Company Owes Merchandise Creditors $1,000,000—To Arrange Three-Year Extension

CLEVELAND, March 6—M. F. Bramley, president of the Templar Motors Co., announced at the annual meeting of the corporation that a syndicate is being formed to settle the claims for merchandise which creditors have against the company to the sum of $1,000,000.

Members of the syndicate are: Bramley, W. M. Pattison and J. C. Brooks. This syndicate is to arrange for the carrying of the claims for three years.

Bramley was re-elected president and general manager; W. M. Pattison, vice-president; D. C. Reed, secretary and treasurer; John Orgil, counsel, and W. O. Cooper, director.

The annual report showed there was an operating loss of $250,000 for the year ending Dec. 31, last, while the inventory was depreciated $750,000. Car sales last year were 732. The company is still working off an inventory, and business has picked up in the last two months.

Six hundred stockholders attended the meeting, and at the close of business adopted a resolution of confidence in the management.

Peed Becomes Overland Assistant Sales Manager

TOLEDO, March 6—L. G. Peed, for more than a year manager of the Willys-Overland branch here, has been named assistant sales manager of Willys-Overland, Inc. R. L. Butler, zone supervisor for Iowa, Nebraska and Missouri, will succeed Peed at the local branch. W. O. Kiracofe, formerly sales manager of the Banting Manufacturing Co. here, has been named retail sales manager of the branch, to succeed L. J. McCracken, who will have charge of the Pacific coast territory for Willys-Overland.

Peed formerly was with the New York branch of Willys-Overland. He has been a prolific originator of sales and advertising ideas, many plans which he worked out for the branches with which he was connected having been taken up by the factory organization and put into effect throughout the country.

From Factory to Owner New Monroe Selling Plan

INDIANAPOLIS, March 4—An advertisement published in one of the local newspapers to-day by the Monroe Automobile Co. tells of a new plan of selling the Monroe direct from factory to owner. The new price of $875, which is a reduction of $420, is also announced.

The announcement is judged to be the forerunner of the reorganization promised at the time that a local bank, which had been the principal creditor, bought the factory and assets from the receiver. It is understood that the detailed reorganization plan will be announced some time next week.

One sentence from the advertisement reads: "Briefly, the plan means the elimination of the distributor and dealer with their commissions and sales expense added to the cost of the car."

Hitchcock Takes Sweet's Place on Bearings' Board

NEW YORK, March 7—William M. Sweet has resigned as a director of the Bearings Service Co. and will be succeeded by A. C. Hitchcock, sales manager of the New Departure Mfg. Co., one of the concerns for which the Bearings company acts as a service department. Sweet's duties with the Klaxon company require all his time. William A. Brooks also has resigned as secretary of the Bearings company and has been succeeded by W. J. St. Onge, sales manager of the company.

Directors of the Bearings Service Co. have appointed an executive body which will be an operating committee. It will meet at the general offices in Detroit four times each year. Alfred K. Hebner, president of the company, will be chairman.

Court Limits Information to Be Given Trade Commission

WASHINGTON, March 7—Under the permanent injunction issued by Judge Bailey in the Supreme Court of the District of Columbia to-day, the Federal Trade Commission will be restrained from compelling various industries to submit monthly reports to the Commission of their costs of production and other intimate details of their business.

Conferences were held with various manufacturers several months ago in this connection, but the meetings adjourned pending the legal decision. Judge Bailey held that manufacturing is not commerce and that the Federal Trade Commission was trying to interfere with commerce.

The case at issue is known as the Claire Furnace Co. case involving twenty-two producers of iron and steel and coke.

Glass Leaves New Britain Machine Tractor Division

NEW BRITAIN, CONN., March 4—Edgar T. Glass, for the last several years sales manager of the tractor division of the New Britain Machine Co., has resigned to take up other work.

No successor has been appointed, but one of the company's officials states that he does not understand it is the purpose of the corporation to abandon the manufacture of tractors permanently. Tractor making was discontinued by the company at the time the industrial depression became pronounced.

Glass came to the New Britain company from the Stanley Works, where he had been associated with the sales force.

Smith Republic Head as Willys Successor

Complete Reorganization of Truck Company—Change in Stock Control Is Forecast

NEW YORK, March 6—Complete reorganization of the Republic Motor Truck Co., Inc., has followed the resignation of John N. Willys as president and the election of Frank E. Smith as his successor, which was announced in AUTOMOTIVE INDUSTRIES last week. Other resignations included those of H. I. Shepherd as treasurer and Walter P. Chrysler and James E. Kepperley as directors. Shepherd will continue temporarily as a director, as will W. J. Baxter and E. C. King.

New directors elected to fill the vacancies were: O. W. Hayes, vice-president in charge of engineering, purchasing and production; H. D. Minich, vice-president in charge of finance and accounting, and Charles G. Rhodes, secretary.

Offices Moved to Alma

It is understood that there has not been, up to this time, any change in the stock control of the company, which has been held jointly by Willys, Baxter and Burt, but this is forecast by a statement of the company that "these changes bring back to the West control which was transferred to New York at the time Mr. Willys and his associates purchased the stock of the company."

The executive offices of the company have been removed to Alma, Mich., where the plant is located. Shepherd will become vice-president of the Guardian Savings & Trust Co. of Cleveland.

Michigan and Illinois bankers now are taking an important part in the affairs of the Republic. As soon as the banks can obtain control of all the notes on which the company defaulted, the new money necessary for working capital will be provided. The company now has current assets of $4,600,000, after taking a loss of $1,000,000 on its inventory. While truck sales were light last year, the company made a large profit on parts replacement business. With the improvement in the truck market and with the readjustment of finances, it is confidently expected that the company will be able to move ahead on a substantial basis.

Branch Houses Established

To promote service and a comprehensive sales plan, the company has established or is establishing branch houses at Detroit, Buffalo, Albany, Boston, New York, Newark, Philadelphia, Baltimore, Atlanta, Charlotte, Pittsburgh, Kansas City, St. Louis, Chicago and San Francisco. It is proposed to establish additional branches within the next few months. New dealers are being added at the rate of approximately 500 a month.

It is understood that one of the specialties hereafter will be the building of motor bus chassis.

Detroit Factories Increase Schedules

Growing Cheerfulness in Evidence at Plants—February Exceeded Anticipations

DETROIT, March 3—Production in Detroit factories for February was notable for the number of companies which materially increased their manufacturing schedules.

Production continued on a four-day week basis. There is a constantly growing feeling of cheerfulness in every factory. Production will be largely increased in March, notwithstanding that February ran far ahead of anticipations.

Dodge, Maxwell, Studebaker, Cadillac and Hupp are the factories already near maximum production. Dodge has been running along at about 600 daily; Maxwell, 200; Studebaker, 400, and Cadillac, 100. Ford has as yet failed to get into full swing on cars, but is making a record breaking number of tractors at River Rouge, schedules now approximating 200 daily.

Hudson-Essex to Triple Output

Hudson and Essex have practically tripled their parts and material releases for March, and President Roy D. Chapin said it would triple production of March of last year. Lincoln Motors will increase its production to a 30-daily basis in March. Increases will also be made by Wills, Roamer and Handley-Knight. Rickenbacker, which shipped 250 in February, will go on a 20 daily schedule in March.

Orders are reported ahead to summer in the General Motors divisions. Buick is preparing to go on full production. Olds has laid down a schedule which will approximate 70 daily in March. Oakland will build better than 100 daily. Chevrolet has laid down a schedule which calls for 50,000 production by July.

Durant Motors has been operating during February at the Lansing plant on a schedule of 40 daily and expects to reach 100 daily by April 1. The company was handicapped by non-delivery of closed bodies in February. Five hundred closed types will be built in March.

Reo Looks for Good Month

Reo has been operating steadily and looks for heavy production in March with dealer stocks of cars and speed wagons undergoing rapid depletion. Dort has laid down a schedule of 50 daily, which will be increased as rapidly as possible. Orders are reported to run ahead to early summer.

Paige has been rounding into production slowly during February and will get going firmly on its Paige and Jewett schedules in March. Earl Motors has been building 20 daily in February and will increase this to 30 in March. Columbia Motors is speeding up things at the factory in anticipation of production in April on its new $985 line. March production will be solely of the former line.

Liberty is all ready to enter upon a heavy manufacturing schedule. Saxon is running along at 5 a day pending the determination of new manufacturing policies.

RESERVE BOARD FINDS OUTLOOK IS BRIGHTER

WASHINGTON, March 3—Commenting on financial and economic conditions for the first two months of 1922, the Federal Reserve Board states that bankers generally believe the recent advances in the value of agricultural products has tended to create conditions materially facilitating both the liquidation of loans at banks and the rapidity of movement of farm products to their markets. These changes give promise that farmers soon will be in the market for motor vehicles as their inability to market their products at reasonable prices has been the chief deterrent.

Reports from the various Federal Reserve districts show that the improvement in conditions in several basic industries has furnished a more hopeful prospect for trade.

Kelly-Springfield Adds to Its Force at Factory

SPRINGFIELD, OHIO, March 7—There is a marked improvement in general business among the motor truck and automobile manufacturers here. General Manager E. O. McDonnell of the Kelly-Springfield Motor Truck Co. states that there is a steady improvement in the motor truck business and that the company has recently added a number of men to its force. There has been special activity in the engineering department. The outlook is considered most favorable.

The local works of the International Harvester Co. is up to its schedule of 50 light, high-speed motor trucks a day. The company is shipping its trucks about as fast as they are produced. There are evidences that the farmers are now in a more optimistic mood.

Service Truck Preparing to Start on Polish Order

WABASH, IND., March 4—Production on the new model Service truck, begun Feb. 15 on a four-a-day basis, has been maintained, and the working force at the plant is being augmented preparatory to starting work on the order received from the Polish government.

The sale of a considerable quantity of gold notes in America to Polish families will be undertaken, it is said, by the same syndicate of Polish bankers that underwrote the order for Service truck equipment.

More Optimism Felt Than in Two Years

Dealers Say Trade Is "Good," "Big," "Bright" in Reports to Manufacturers

NEW YORK, March 3—Nearly 100 representative members of the National Automobile Chamber of Commerce who attended the meeting here yesterday were more enthusiastic than they have been for two years over the business outlook. Roy D. Chapin, president of the Hudson Motor Car Co., who presided, declared conditions were better than at any time since the depression began. He based this assertion upon reports from manufacturers and dealers all over the country.

These dealer reports were practically unanimous in the statement that February business was materially better than January. One striking fact disclosed by the survey is that the situation in agricultural sections has improved. Even in the Dakotas the tone is much better. Only one of the many reports described business as not so good.

Prices Stabilized

Dealers used such adjectives as "good," "big," "bright" and "better" in describing the outlook for sales this month and next. This optimistic forecast was based on the belief that prices have been stabilized and that was the unanimous plea of the dealers.

Truck as well as passenger car sales have improved, and the demand for commercial vehicles is growing steadily.

Sales of high priced cars in the New York Metropolitan district were 39 per cent larger in January than in January, 1921. Sales of low priced cars were 259 per cent larger. Sales in the $1,000 (wholesale) class doubled in January, as compared with December, and in the $500 class they almost doubled. The greatest decrease in the January sales as compared with December was in the class above $4,000 and in the $1,500 class. Sales of ½-ton and ¾-ton trucks more than doubled.

National Shows Most Successful

A report made to the members on the New York and Chicago shows disclosed that they were the most successful ever held from the standpoint of attendance. A return of 77 per cent of their footage costs was ordered for members who exhibited at the New York show and of 91 per cent to those who exhibited at Chicago. This was in addition to retaining $25,000 in a trust fund for a show building. This fund will be used as a guarantee that a suitable exhibition place will be available in New York.

HYLAN URGING BUS VOTE

NEW YORK, March 7—Mayor Hylan has sent a telegram to every member of the Legislature asking them to vote for his bill, empowering the city to spend $25,000,000 for the purchase of city buses.

Industry Employs 11,149 More Hands

6.5 Per Cent Increase Reported During February—Instances Cited in Government Survey

WASHINGTON, March 7—General increases in employment were reported in the automotive industry during February, according to a survey by the United States Employment Service. The largest gain in employment was noted in "vehicles for land transportation industry," which consists principally of automobile and accessory manufactures. The amount of increase in employment under this classification during February amounted to 11,149, an increase of 6.5 per cent from Jan. 31.

A study of the relative weights of the 14 groups covered by the survey shows that the vehicular industry employed 11 per cent of the total reported employed in all groups on Feb. 28. As illustration of the growth of employment in the automotive industry, it is pointed out that in Springfield, Ill., a tractor plant is steadily adding to its forces; some automobile plants have reopened in Indianapolis, and the erection of a new large truck plant will start on March 16 in Fort Wayne, Ind.

8500 in South Bend Plant

A large automobile corporation in South Bend is now employing 8500 men and will have 10,000 on the payroll before the summer. In Cleveland one motor company, the city's largest manufacturer of motor cars, has given employment to hundreds of men and the production has increased 50 per cent. In Dayton, a rubber company reports 150 per cent increase over last year, and is going full time day and night.

The economic pendulum that started on a downward swing in December and continued through January took an upward turn in February. While the joints of industry are still stiff, yet there is a resiliency to business that is very encouraging and with every indication of permanency.

Employment increased in all industries with the exception of textiles, which shows a marked decrease, due to the industrial controversy existing in the New England district. The basic industries, food, iron, steel and metal products, railroad repair shops, and vehicles for land transportation, made substantial gains.

Reports from 231 of the principal industrial centers, with but few exceptions, show a general improvement in employment conditions and an enthusiastic spirit of hope and confidence in the future. Weather permitting, March will begin an era of great activity.

BEST JANUARY FOR HUPP

DETROIT, March 7—President Hastings of the Hupp Motor Car Corp. announces that shipments in January were the largest for any January in the history of the company. He reports that four times as many cars were shipped in January last as in January, 1921, twice as many as in January, 1918 or 1916, and three times as many as in January, 1919.

DETROIT FIRMS SHOW GREATER EMPLOYMENT

DETROIT, March 6—Substantial evidences of steadily increasing production in the automotive field is found in the employment reports of the 79 firms which are members of the Employers Association. The statistics for the first eight weeks of 1922 follow:

Week Ending	Number Employed	Net Change
Jan. 2	60,981	Inc. 8,795
Jan. 10	102,485	41,534
Jan. 17	109,703	7,218
Jan. 24	111,615	1,912
Jan. 31	113,099	1,484
Feb. 7	115,092	1,993
Feb. 14	118,647	3,549
Feb. 21	121,048	2,407

Liberty, with Many Orders, Enters Heavy Production

DETROIT, March 7—The Liberty Motor Car Co., with a long string of orders piled up from the early 1922 shows, has entered upon a period of heavy production that will carry it through to early summer. The output for March will exceed that of any month in 1921, and the program for April calls for production and shipment of more cars than for any month in the record year of 1920.

As an indication of the Liberty sales stimulus, the company declared that applications for retail sales rights were received from 53 dealers at the New York show alone. Nine factory territorial men have been added to the staff to handle applications for unoccupied dealer territory.

Cliff Knoble has returned to his position as advertising manager of the company after an absence of several months. The company is going in for an extensive sales and advertising campaign which will be launched about April 1.

Give Public Wide Use of Bus, Franklin Urges

SYRACUSE, N. Y., March 4—Restrictions of motor buses should be limited to safety requirements, in the opinion of H. H. Franklin, head of the Franklin Manufacturing Co.

"If the public chooses to travel by motor bus, it should have the unrestricted privilege," he said. "If the motor bus cannot give a cheaper and better transportation, it will not survive. There should be no restriction on the number of buses or bus lines even between the same points. There is no justification whatever for the excessive taxation. The motor bus or truck should not be taxed in any greater proportion than other vehicles. Let competition and experience shape the future of the motor bus, not restrictive regulation."

Investigating Auto Stores Transactions

Department of Justice Takes Hand in Affairs—Temporary Receivers Made Permanent

PHILADELPHIA, March 6—Judge Thompson in United States District Court to-day appointed as permanent receivers for the United Auto Stores, Inc., the temporary receivers, Francis F. Burch and Samuel E. Whitaker, remarking in open court that he was satisfied there was fraud and mismanagement in the conduct of the concern.

Judge Thompson's comment came in reponse to a demand from Abraham M. Rose, one of the attorneys for Edward B. R. Carrier, head of the United Auto Stores, that the company be permitted to function as a going concern.

Immediately after the receivers had been made permanent, Aarons, Winstein, Goldman & Stone, attorneys, filed a petition of bankruptcy against the United Auto Stores.

Joseph K. Kun, assistant district attorney, asserted that the only hope for the creditors was in a permanent receivership. He further said that he had figures to show that in the last two months the stores lost $55,000 and that the corporation's overhead for salaries alone came to $9,300 a week.

Washington Orders Action

Agents of the bureau of investigation of the Department of Justice have taken a hand in the affairs of the United Auto Stores. It is asserted that if there is evidence that Federal laws have been violated arrests will follow immediately. Orders to investigate the company came from Washington.

Two agents have been assigned to investigate every transaction between the United Auto Stores Co. and the United Guaranty Co., which sold stock for the former company. Postoffice inspectors also are conducting an investigation into the affairs of the concern.

Budd Wheel, with 50 Service Stations, Expanding System

PHILADELPHIA, March 6—The Budd Wheel Co., which now has more than 50 service stations located as far as possible with well established wheel dealers and repairmen in the larger cities of the United States and Canada is steadily expanding its service system.

All of these stations are carrying spare parts for both wire and disk wheels, in addition to an assortment of wheel parts and equipment. The service stations are also prepared to make repairs on wheels, and they soon will be provided with apparatus for straightening disk wheels. Inasmuch as the Budd Michelin disk is manufactured to the same dimensions as the Michelin wheel in Europe, it is possible for these stations to equip imported cars.

Factory Supervision, Show Need, Miles Says

In Report to N. A. C. C., Manager Recommends Better Salesmanship at Booths

NEW YORK, March 4—Better salesmanship is needed before the automobile shows can realize their maximum possibilities, S. A. Miles, show manager, says in his report to the members of the N. A. C. C. Conditions at Chicago were somewhat better than at New York, he states, due largely to the efforts of the Chicago Automobile Trade Association which offered daily prizes for the best salesmanship and kept up constant investigation of conditions.

In his report, Miles says:

No matter how successful the shows may have been in the matter of financial returns, I feel that we have a further responsibility in determining to what extent they have been successful in other ways and what steps are necessary to insure their permanent value. It has probably become evident to most observers that salesmanship in the automobile industry has not reached the peak of perfection.

Influence of Past Bad

For fifteen years or more we have enjoyed a condition which, in some respects, has an unfortunate influence on some of the salesmen of today. In many cases it has not been necessary to devote great energy or skill to the sale of cars. Some of our salesmen have grown into the habit of being approached rather than approaching.

Miles relates the experiences of some of the representatives appointed by the Chicago association to observe conditions at the booths during the show in that city. the manner of the salesman's approach, his general conduct and knowledge of the industry. These experiences showed lack of attention and general indifference to a prospect's wants, the salesman on occasions adopting the position of a booth attendant.

He then proceeds to state:

The lesson we may learn from these conditions is, I think, that the exhibits lack adequate supervision. Year by year the men at the top become more and more conspicuous at show time by their absence. This has been particularly noticeable at Chicago. On one day of the show, in an endeavor to obtain an answer to the question so frequently asked, whether any actual business was being produced, I made a personal visit to every exhibit in the Coliseum.

Few Factory Executives

My acquaintance in the industry is fairly extensive but I was able to find only three men of my acquaintance and only one of these was a factory representative of major importance. The same remark is true of casual visits made at other times during the week. It is also true of my visits during the New York show.

On many occasions it is necessary for us to get into communication with the gentleman named in the show contract as the official representative of the exhibitor. I think it perfectly safe to say that not once in four times did we find the representative in the building. That the Chicago investigators reports are true, I know from the fact that not in a single instance during my trip through the building was I accosted by a salesman.

It is my belief that if the shows are to continue successful in all respects, a higher order of salesmanship must be developed under the eyes of the members and their higher class representatives.

Rubber Makers Start New Plan for Meetings

NEW YORK, March 6—The tire manufacturers division of the Rubber Association of America will inaugurate its plan of holding regularly quarterly meetings of the entire division at New York, or occasionally some other city, on Tuesday, March 21, when a meeting will be held at the Hollenden Hotel, Cleveland.

The executive committee of the division believes that the practice of holding an occasional meeting at Cleveland, Chicago or some other Middle Western city will be appreciated by many dealers west of Ohio who find it inconvenient to attend meetings in New York.

The Cleveland meeting will indicate whether the plan to hold meetings away from New York will result in increased attendance and interest.

Ford Owners' Association Is Object of Ohio Attack

CHICAGO, March 3—The State of Ohio has started a war against the operation of the Ford Car Owners' Protective Association, with headquarters in Chicago.

It is declared that the insurance concern has been doing business in Ohio without the authority of the State Insurance Department and that it has defied the department to interfere with its operations. The company did business at one time in Michigan, Wisconsin and Indiana.

One of the first steps against the association in Ohio came in the arrest of S. M. Green, district manager, under an indictment charging him with selling insurance without a license and with placing insurance with an unauthorized company.

Shareholders Must Pay Pan American Stock Notes

DECATUR, ILL., March 4 — Subscribers to the stock issue of the Pan American Motors Corp. will be called upon to pay notes they gave for such stock, although it is probable that common stockholders will get less than 20 cents on the dollar. A statement to Judge Baldwin, sitting here, shows that W. A. Phares, former treasurer, for whom a warrant charging embezzlement has been issued, owed $13,465. Real estate and buildings valued at $100,035.99 would bring about $150,000, it is said, but this sale has not been ordered.

The service department of the company, which has been showing good profit, is under operation by permission of the court.

Bulletin Explains New Tire Warranty

Accompanies Poster Sent by Rubber Association of America to 125,000 Dealers

NEW YORK, March 6—The Rubber Association of America has sent to approximately 125,000 dealers a poster on which is printed the standard tire warranty and claim form. Dealers are requested to display this poster prominently. With it the association has sent to each dealer a bulletin which says:

"The unsoundness of the former tire adjustment conditions is emphasized by the fact that clothing, footwear, household appliances and innumerable articles of utility (which are subject to service under conditions which the manufacturer cannot control or ascertain) are not sold with a definite guarantee of service and an unsoundly liberal adjustment policy. There is apparently no good reason why tires should be an exception. The abuse of the former condition in the tire industry tended to increase costs and the whole purpose of the present movement is to eliminate the economic waste.

Old Policy Costly to Dealers

"Entirely too many of the adjustments formerly made were what the industry knows as "policy" adjustments. The dealer loses most by that kind of an adjustment, because each tire thus furnished prevents a new sale by some dealer. It is no exaggeration to say that "policy" adjustments annually took millions of dollars from the pockets of the dealers alone.

"Under the standard warranty and claim form, only those tires which are faulty in material or workmanship will be considered for adjustment, and then only upon the basis outlined in the second paragraph of the warranty. Tires cannot be adjusted if run on wheels out of alignment, on shaky wheels or with lugs improperly tightened, causing unusual wear, of if damaged by either cuts, jabs or stone bruises, or by underinflation or overloading.

Annoyance Eliminated

"For the dealer, the new condition will eliminate much annoyance and loss of profit, and it should remove all apprehension that some other dealer is going to do the thing that you know to be unsound and unbusinesslike. The consumer will benefit, because formerly the careful user had to carry the burden created by the careless user. Now each user will pay his own way. If the tire is defective, the owner can get fair treatment provided he makes a claim in the specified manner."

ABRASIVE COMPANY SCHEDULES

NEW YORK, March 6—Schedules in bankruptcy have been filed by the Worcester Abrasive Co., Inc., manufacturers of automobile grease valves. Liabilities are listed at $21,868 and assets at $7,700.

Vote Amalgamation of Northway Firms

Assets of Three Companies Pooled —To Issue $400,000 8 Per Cent Gold Notes

NATICK, MASS., March 7 — The Northway Motors Corp. met to-day at the factory, and with 250 stockholders present, it was voted to amalgamate the three corporations bearing the Northway name, the Northway Motors, Northway Motors Sales Corp. and Northway Motors Guarantee & Discount Corp. All the assets of the three companies were pooled with the formation of the new corporation, and it was voted to issue $400,000 8 per cent three year gold notes, and the stockholders were asked to make contributions of 10 per cent on their stock.

The plant, at present, is almost shut down, but it is expected to be opened this week and production started on incompleted trucks. There is material on hand amounting to $500,000, on which there is an indebtedness of $100,000. To complete 200 trucks nearly finished will take $120,000, and when sold they will bring $780,000. The loss last year was $217,000.

The directors elected were: Judge Henry C. Mulligan, Reginald C. Heath, Frank V. Noyes, Stephen W. Holmes and R. E. Northway. William Caswell was chosen treasurer and Robert Holmes secretary.

New Oldsmobile Model Has Added Equipment

LANSING, MICH., March 4—A new body, known as the model 37 super-sport car with a number of items as additional equipment which are standard on this model, has been put out by the Olds Motor Works. The car is upholstered and completely trimmed in maroon leather. It is painted jersey brown. The car is equipped with Tuarc disk wheels, individual cast aluminum bracket type steps with molded rubber tread and individual bicycle type fenders with splash aprons.

In addition, the following features are standard equipment: Gabriel snubbers on rear, triple bar steel bumpers, Boyce deluxe motometer mounted on a bar type of radiator cap, windshield cleaner, cigar lighter, double plate-glass windshield wing, stop signal, cowl ventilator, spotlight mounted on left front fender apron, step light for both rear doors and a bevel glass, rear-view mirror. There is a leather top boot and a carrier for two extra tires. This car, complete, as described, is priced at $1,825.

FORD IMPROVES EQUIPMENT

DETROIT, March 6—A new type headlamp lens, known as the Ford H, is now being fitted as standard equipment on all Ford cars and is being supplied to branches and dealers for service and replacement. The lens has vertical flutings and is used in connection with a 21 candlepower gas filled bulb with clear glass. The lens is said to meet the requirements of all state laws.

Other improvements that have been recently made are the improved wiring system, which meets the requirements of the Fire Insurance Underwriters, the pressed steel muffler which replaces the muffler with cast ends and brackets, the redesigned pistons and connecting rods which have been made lighter, the one-piece runningboard brackets, the improved fan assembly, the new design starting switch and the dash weather trough to keep water from the coils.

Timken Axle Denies Combination Report

NEW YORK, March 8—A. R. Demorey, president of the Timken Detroit Axle Co., has sent the following telegram to AUTOMOTIVE INDUSTRIES:

"Recent rumors concerning the Timken company cause us to feel we should clearly state our position. We are not in a combination with parts makers, either in the sale of units or servicing nor are we in any combination with any automobile or truck manufacturer. The Timken Detroit Axle Co. is in business to manufacture axles and sell them to anyone willing and able to buy and pay for them.

"It happens that for the purpose of servicing the users of our products we are selling parts to a number of parts stations, who also happen to sell the products of other well known unit makers, but this is purely an arrangement between us and the parts station, and not a group arrangement between the unit makers. We feel we owe this statement to ourselves, to our customers and the trade in general.

"Briefly our position is this: We are axle manufacturers. We own and control our business and consider every automobile and truck manufacturer as a possible customer. Every arrangement we have is a very simple contract for the sale of axles at a definite price. Our interest in the customer we sell to is purely one of servicing as a unit maker."

NEW MARMON SPEEDSTER

INDIANAPOLIS, March 6—A new 4-passenger speedster is now in production at the Marmon plant. It is a decided departure in appearance from the other open cars and gives an effect of length and lowness. Equipment differing from that of the open cars includes a trunk rack at the rear, spare wheel mounted in a saddle sunk in the left runningboard, top bows of natural wood with nickel plated mountings. The price is $3,950.

HOLLIS EXHIBITED

TIFFIN, OHIO, March 6—The Hollis electrically driven automobile model, which was constructed in Hollywood, Cal., arrived here this week and was placed on exhibition at the Hollis Tractor plant. The company, which has been working on its factory here for two years, is preparing for manufacture.

Will Capitalize New Maibohm at $500,000

Preferred Stock of Two Classes Is Provided Under Present Plan

TOLEDO, March 7—Creditors of Maibohm Motors Co. have been granted five days to authorize a new plan for the sale of the company to a syndicate of Sandusky citizens, represented by A. C. Burch as agent. The new company will be capitalized at $500,000 in preferred stock of two classes. Class A will be 6 per cent cumulative, dividends commencing two years from date of issue. Creditors will receive this pro rata with their claims as finally approved. They will be represented by three directors on the board.

The new company will raise sufficient cash to take care of court costs, tax claims and will attempt to have Federal claim deferred. Total tax claims are $76,000. A total of $160,000 of new capital will be provided by the Sandusky interests. Preliminary offer contemplates a $200,000 first mortgage and other liens not to exceed $200,000 on the property.

A $10,000 guaranty fund has been been posted by the purchasing company in the Third National Exchange Bank in Sandusky. The committee says creditors will receive 60 to 65 per cent of the face value of claims by this arrangement, and that it is the best which can be submitted. A bankruptcy sale would leave practically nothing for creditors after tax and prior claims were paid.

Two Models of London Placed on Exhibition

DETROIT, March 3—Two models of the London, a 6-cylinder car, made by London Motors, Ltd., of London, Ont., are being shown at the annual Windsor show this week. The car is assembled from standard units, Herschell-Spillman engine being used, together with Norwalk propeller shaft and universal, Warner gearset, Bosch ignition and electric equipment, Gemmer steering gear and Laminated wood wheels. The wheelbase is 126 in. Prices are phaeton $2,700, sedan $3,700, coupé, $3,500, supreme phaeton $2,900.

Production has been under way on a small scale at the London plant pending the opening of spring business. Many orders are reported to be on the books of the company. It is expected to bring out a 4-cylinder car later in the spring, the phaeton to sell at about $1,400. W. R. Stansell is president and general manager of the company, and is also the designer of the car. The stock is mostly in the hands of London business men.

Most other cars at the show are Canadian editions of American cars: Studebaker, Gray-Dort, McLaughlin-Buick, Dodge, Chevrolet, Hupp, Reo and Ford. A Lincoln shown in the Ford exhibit attracted much attention.

Overland Phaeton Price Cut to $550

In 1916 It Was $615—Reductions Made on All Willys-Knight Models

TOLEDO, March 3—Price reductions on the open models of Overland cars and on all models of the Willys-Knight are announced by Willys-Overland, Inc. The price of the Overland phaeton and roadster is reduced from $595 to $550.

The Willys-Knight list follows:

	Old Price	New Price
Roadster	$1,475	$1,350
Phaeton	1,525	1,375
Coupe	2,195	1,875
Sedan	2,395	2,095

The price of the Overland phaeton only a year ago was $1,035. It sold in 1916 for $615. The latest reductions have been made possible, it is stated, by manufacturing economies, the liquidation of high priced inventories and the elimination of obligations for materials at high cost.

New List of Prices Announced by H. C. S.

INDIANAPOLIS, March 6—The H. C. S. Motor Car Co., of which Harry C. Stutz is president and general manager, has announced a new list of prices. The schedule is as follows:

	Old Price	New Price
Phaeton	$2,775	$2,400
Coupe	3,450	2,850
Roadster	2,725	2,400
Sedan	3,650	3,150
All weather roadster	....	2,550
All weather phaeton	....	2,600

NEW DIXIE FLYER LISTS

LOUISVILLE, KY., March 6—The Kentucky Wagon Mfg. Co. announces price reductions on the various models of its Dixie Flyer, ranging from $100 to $350. The schedule follows:

	Old Price	New Price
Phaeton and Roadster	$1,195	$1,095
4-passenger Speedster	1,395	1,245
Coupe	1,895	1,545
Sedan	1,895	1,595

Rolls-Royce Phaeton Is Now Priced at $10,900

SPRINGFIELD, MASS., March 7—A new price of $10,900 for the Rolls-Royce phaeton is announced by L. J. Belnap, president of Rolls-Royce of America. This price is guaranteed and represents a substantial economy to Rolls-Royce customers. In his announcement, Belnap says that in the two years it has been on an operating basis, the company has determined its costs and perfected methods and organization in such a way as not only to equal but to excel the English-built car. He adds:

It is a fact that with the American mechanic, equally skilled as he is with the English mechanic, and excelling him as he does in enthusiasm and initiative, due to more favorable labor conditions, we are actually building the Rolls-Royce in America, not only better than it has ever been built before but more economically. We have this advantage that, with our already acquired long experience in building Rolls-Royce cars in England, over here we have not suffered from many manufacturing difficulties and problems which would be eliminated only by beginning new, as we did here in Springfield, Mass.

CLETRAC F MODEL REDUCED

CLEVELAND, March 4—The Cleveland Tractor Co. has made a reduction in the price of its new Model F from $795 to $595. The company announces that production will shortly be increased from 20 per cent of normal to 60 per cent.

BEEMAN TRACTOR, $240

MINNEAPOLIS, March 3—The Beeman Tractor Co. of this city has reduced the price of its Model G to $240. This company now makes a smaller model known as Beeman Jr., which sells for $180.

ARO PRICE DROPS

MINNEAPOLIS, March 6—The Aro Tractor Co. has reduced the price of its model E tractor from $450 to $385, f.o.b. Minneapolis.

British Exports Drop While American Gain

WASHINGTON, March 4—Analysis of British automotive exports for December, compiled by Commercial Attaché W. S. Tower at London, shows a sharp decline as compared with the previous month. American shipments for the same month revealed an increase.

Exports of British made passenger cars for December show a total of 33, valued at £25,257; 14 trucks, £11,651, and 9 chassis, £13,866. Three cars and two trucks were sold in Brazil; 4 cars and 7 trucks in Argentina, and 2 chassis in this country.

Ford Service Policy Also Will Be Lincoln's

CHICAGO, March 6—It is the intention of Henry Ford to make the service of the Lincoln car as complete as that of the Ford car just as soon as possible.

The following inquiries recently were addressed to Ford:

1—Is the flat rate system that has been so beneficial to Ford dealers and Ford cars to be put in effect for the Lincoln?

2—Is it expected that the Lincoln and Ford cars will be serviced through the same service departments?

3—Will you follow the well established Ford policy as to permitting parts of other manufacturers to be used on the Lincoln car?

4—Do you expect to make the Lincoln service as universal as Ford service?

The reply from Ford's personal office was as follows:

Answering your inquiry addressed to Mr. Ford, we desire to advise that Ford policies will gradually be put into effect in the Lincoln Motor Car Co. or as fast as it is possible to do so.

Guaranty Trust Co. Discusses Prices

Sees Industry at End of Revision Period—Pre-War Comparison Impossible

NEW YORK, March 2—The Guaranty Trust Co., in discussing automobile prices in its monthly survey, states that "approximate stabilization of automobile prices is believed in the industry to have been definitely reached."

It then goes on to say:

The average price of 49 of the principal standard touring car models is now 22 per cent below the average price on Sept. 1, 1920, but the price of the greater quantity of cars sold represents a much greater reduction, some as much as 42½ per cent. This reduction has been brought about by a series of price cuts spread over more than a year, so that we now stand at what appears to be the end of the period of price revision rather than at the beginning. In view of known improvements and refinements in the product, no comparison of present prices with those of 1913 is possible or significant.

Smaller Reductions an Indication

This conclusion in regard to stabilization is based not only upon the amount of the average price reduction that has taken place, but also upon the progressively smaller price cuts made recently by leading manufacturers. Furthermore, at least six manufacturers have raised their prices since the first of the year, and there is justification for the belief in an apparent stabilization of the costs of the chief materials entering into motor car manufacture.

Many people believe that the prices of raw materials entering into the manufacture of automobiles have reached bottom. In the case of some of these materials a renewal of the upward price trend has been manifested. The average price of metals and metal products is now nearer the 1913 level than that of any of the nine groups, except farm products, for which the Bureau of Labor Statistics compiles price data. It appears, therefore, improbable that automobile production costs can go materially lower for some time.

Inventories have been well liquidated in the automobile industry and the industry brought to a sound position, where no justification of further general price reduction appears to exist.

Pennsylvania Railroad Takes Up Use of Trucks

BALTIMORE, March 6—The Merchants and Manufacturers Association has been informed by the Pennsylvania Railroad Co. that a plan for motor truck distribution of freight is under consideration for this city.

It is the belief of Robert C. Wright, general traffic manager of the Pennsylvania, that the vast volume of less than carload traffic congests the rails of the terminals and interferes with the proper handling of carload traffic. For that reason he believes it should be eliminated entirely from important stations and provided for by the construction of a large warehouse on the outskirts of the city from which store-door deliveries would be made by motor truck at the expense of the railroad.

Lighter Cars Meet Favor in Australia

Low Fuel Consumption, Selling Factor—Market Far from Saturation Point

WASHINGTON, March 7—There is a considerable demand for low and medium priced cars of American make in Australia. A study of the situation by A. W. Ferrin, formerly trade commissioner in Melbourne, shows that American cars retail in Australia at about twice the American price on account of the recent conditions of exchange, freight and other charges. Gasoline, all of which is imported, tires, and other supplies also cost about twice as much as in the United States, consequently the car with low fuel consumption and easiest on tires makes a stronger appeal than a heavier car.

One Car to 67 Inhabitants

The fact that Australia has only one automobile to 67 inhabitants indicates that the market is far from a saturation point. In addition, the average Australian income is higher than the American or Canadian, and the proportion of the population which can afford an American car is probably considerably greater than the possible percentage in this country.

It is significant to note that 90 per cent of the cars now in use in Australia are for purely commercial purposes, and the automobile is recognized as an important element of transportation on that continent.

American exporters of automobiles will be interested to know that the high initial cost and the high cost of operation, together with the light road beds, have so far been against the large use of motor trucks. A mistaken impression as to the economy of horse transportation is probably the greatest barrier to the spread of automotive carrying.

Better Roads Will Help

The average rural operator does not appear to have investigated the question of horse versus truck very scientifically, and it is difficult to find one who can tell just what it costs him to transport his products by wagon. There is little, if any, doubt that with the improvement of roads to the point of withstanding heavy traffic in all weathers, the motor truck will win its way in Australia. The first requisite of success for the motor truck is better roads; the second, wider education as to the value of motor transport; the third, greater technical knowledge in the rural districts, where the number of men who can now operate a truck is small.

Trucks are used in fair numbers in Sydney, the undulating streets of which are hard on horses, but not to any extent in the better paved streets of Melbourne, Adelaide, Brisbane, Perth and other large cities. Initial cost is the chief objection to the commercial car in these cities.

The overstock of motor cars in Australia, which six months ago was seriously depressing the market, has been entirely cleared up, according to advices from Melbourne and Sydney, and importations of American cars have greatly increased. Australia was the third largest purchaser of American cars during 1921, and her imports of motor cars from the United States were three times as great as those from the United Kingdom.

Shipments of American cars to Australia numbered 3740 in 1921 and 3905 in 1920, a remarkable showing in the face of the adverse conditions prevailing during the first six months of the year, when the low conversion rate of Australian sterling, restrictions of remittances to foreign countries, and other factors were reducing all imports to a minimum.

Treasurer Is Appointed Miami Cycle Receiver

MIDDLETOWN, OHIO, March 8—Anthony H. Walburg, secretary and treasurer of the Miami Cycle & Manufacturing Co., has been appointed receiver for that corporation. The application was made by the company, but it was the result of a suit filed against it by the Empire Trust Co. of New York to force payment of notes. The company has outstanding $371,900 in common stock and $656,200 in preferred. The common is closely held. There is no funded debt.

The company was incorporated in 1894 to manufacture and distribute bicycles, coaster brakes, pedals, etc. The plant here covers an entire city block and contains a total floor space of 175,000 sq. ft.

Home Demand Sustains British Automotive Market

LONDON, Feb. 28 (*by mail*)—Were not the home demand for light cars exceeding expectations, Britain's motor trade would be on the verge of collapse. There is no demand for heavy types, though sales of medium cars are fairly satisfactory. Demand for side-cars, motorcycles and trucks are far below normal.

There is a possibility of further price reductions, for labor by now thoroughly realizes the position the trade is in. As matters stand, foreign sales must be accelerated if factories are ever to work at capacity.

CLEVELAND RE-ELECTS OFFICERS

CLEVELAND, MARCH 6—All present officers and directors were re-elected at the annual meeting of the Cleveland Automobile Co. held in this city. The company did not make public its financial condition, but it was stated that production at the factory is increasing. Between 35 and 40 cars were made daily in February, and Secretary J. L. Krall said approximately 1500 would be turned out in March.

French Offer Prize for Aviation Motor

Competition Open to Foreign Makers—Must Be Ready by March 1, 1924

PARIS, March 1 (*by mail*)—Two million francs are offered in competition for the best aviation engine for commercial service of either French or foreign construction. Details of the competition have not yet been decided, but it is probable that after a preliminary test of 5 hours on the bench and 2 hours on a plane at an altitude of 6500 feet, the engines will have to undergo a 240 hour bench test, in periods of 8 hours, the entire tests to be finished within 100 days. There will be penalizations for all stops, changing of parts or repairs.

The competing engines, which will have to be ready for the tests by March 1, 1924, must develop between 350 and 450 hp., and weigh less than 7.2 pounds per horsepower without accessories. The object of the competition is to develop a really reliable engine, capable of being used for long periods without overhauling for commercial flying.

Of the two million francs, one half is offered by the French Government and the other by a public committee. The Government million will be used to cover the expenses of the trials and to offer two prizes of 300,000 francs each for the most reliable French engine and for the one having the best economy with the lowest head resistance.

The million subscribed by the public committee will be used to purchase the winning engine if of French construction, or to purchase the manufacturing rights if of foreign origin. Entries for this competition are received until Dec. 1, 1923, the fee being 25,000 francs, of which half will be refunded. Foreign makers will have to deposit 10,000 francs to cover the cost of the bench tests.

Imports of Cars and Tires Declined in New Zealand

LOS ANGELES, Feb. 6—Official trade statistics for New Zealand record a substantial decrease in the imports of automobiles during 1921. The United States, which for the past four or five years has supplied fully 85 per cent of all cars imported by the Dominion, was particularly hit by the slump in the demand.

The number of motor cars imported by New Zealand in 1921 totaled 3843, compared with 11,994 in 1920 and 6100 in 1919. Imports of automobile tires also declined considerably. In 1921 tires imported were valued at £715,306, compared with £1,803,961 in 1920 and £860,048 in 1919.

The drop in the total trade of New Zealand last year amounted to approximately £19,000,000. The 1921 imports aggregated £42,942,443, compared with £61,595,828 in 1920 and £30,671,698 in 1918.

Washington Shown Low Priced "Star"

Durant Responsibility Ends With Completed Car—Separate Distributing Organization

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but many details remain to be worked out. Definite decisions have not been reached on all the parts which will be used and it is understood prices will be the determining factor. The phaeton will have a full five-passenger touring body of good appearance.

Official details still are lacking concerning the exact relations between the parts makers and Durant in the new venture. While sales plans have not been worked out, there is no reason to believe that distribution will be through the organization which Durant has built up for his own line, although the showing in Washington will be made with a background of Durant cars.

Offices for the Star Motor Car Co. have been rented at 511 Fifth Avenue. The Durant Corp., which handles stock sales for the Durant enterprises, is located in the same building. The new company has not yet been incorporated, and the names of those who will be the incorporators have not been disclosed.

Orders for June 15 delivery of the new car are being taken at Washington, and purchasers are guaranteed against a reduction of prices. The Star will be displayed in other cities before actual production is begun.

Durant headquarters characterizes as "interesting" a report that Durant has just completed arrangements for big banking connections in Wall street for his properties. The report has it that a large order for wheels was placed at a highly advantageous price because it was possible to pay cash. This report was responsible for a sharp upward turn in the stock of Durant Motors, Inc., on the curb market.

NO GERMAN FORD PLANT

DETROIT, March 8—Henry Ford denies reports that he proposes to establish a huge branch factory in Germany in which to manufacture cars, trucks and tractors. It is understood this plan was given consideration but later abandoned. An extensive business in Holland and Belgium is being done through the Antwerp assembly plant which was opened Jan. 1. The territory covered includes Switzerland and Luxembourg. The manager is Don Critchley, formerly of the New York branch.

VARNISH MEN MEET

BROOKLYN, March 6—The plant managers of the New York and northern New Jersey section of the National Varnish Association at their twenty-fifth meeting elected Frank M. Schumann chairman and E. J. Cole secretary. Both are connected with Hilo Varnish Corp. The subject discussed at the meeting was "Driers and Drier Specifications," in which Dr. Percy H. Walker of the Bureau of Standards took part. The next meeting will be held March 16 when the subject to be taken up will be "Cost of Trucking and Its Inclusion in Cost Accounting Systems."

First Engineering Details of New "Star," Car Durant Is Building

NEW YORK, Mar. 7—The first engineering details of the new Durant built "Star" were learned here today. The car is to have a wheelbase of 102 in. and will weigh about 1800 lbs. The engine will be a four cylinder Continental with bore of 3⅛ in. and stroke of 4¼ in. A number of details and engineering features are not yet definitely settled.

The four cylinders will be cast in one piece with the upper half of the crankcase, a conventional L-head construction being employed. Whether the distribution will be by gears or chain is unsettled.

Pressure lubrication will be supplied through a hollow camshaft, to main bearings, with splash to connecting rods. The electrical units will probably be of Auto Lite make, with conventional drive, probably off the water pump shaft for the generator. Bendix drive will be used on starter, which will engage with toothed flywheel in usual way.

Water circulation through a flat tube type of radiator will be by centrifugal pump. A belt driven fan is provided. The engine will be mounted by four-point support on cross members, and not attached to main frame.

The layout of clutch, gearset and frame is similar to that used in the four-cylinder Durant, the gearset being mounted as a separate unit amidship, and connected with engine by universal joints which are not of the fabric or all-metal type, but a combination of the two without metal-to-metal contact.

The clutch is almost identical with that used in the Durant, being of the single plate type with direct acting springs and multiplying levers for disengagement. Clutch facings are of the molded type and are allowed to float.

The gearset is a conventional three-speed type, similar to the Warner gearset used in Durant cars, but may or may not be made by the Warner Gear Co. A longitudinal tubular frame member which serves also as a muffler is employed to minimize torsional deflection with accompanying body troubles.

Side members of the frame are straight 1½ x 4 in. channel, arranged to accommodate light commercial as well as open and closed passenger bodies. All springs are semi-elliptic. Details of rear axle are not settled, but it will be semi- or three-quarter floating Timken, with Timken bearings and 10 in. brake drums accommodating both sets of brakes. Front axle is of I-beam type and has Timken wheel bearings. Hotchkiss drive and two Spicer joints are employed. Steering gear will probably be of worm and wheel type, but this and the make to be used are unsettled.

No special light truck chassis with longer wheelbase and heavier rear axle is contemplated at present.

Detroit Has Reciprocal Exchange Insurance Plan

DETROIT, March 7—The Detroit Automobile Inter-Insurance Exchange has been organized as a reciprocal exchange insurance plan to furnish all forms of automobile insurance at cost to members of the Detroit Automobile Club. Actual writing of insurance will begin with the issuance of a charter.

Rates of the new insurance at the outset will be 10 per cent lower than the conference rates. This will be lowered as a surplus fund is accumulated.

LOWMAN BILL ADVANCES

ALBANY, March 9—The Assembly has concurred with the Senate in the passage of the Lowman bill, which is intended to regulate the size and weight, capacity and rate of speed of motor trucks, trailers and omnibuses and authorize the state highway commission to inspect motor vehicles to detect overloading, inadequacy of the equipment and other violations.

Gasoline Consumption Greatly Exceeded 1920

WASHINGTON, March 6—Refinery statistics for the calendar year 1921, compiled by the Bureau of Mines, shows that the domestic consumption of gasoline for 1921 exceeded the previous year by 260,000,000 gal., and 1919 by 1,081,000 gal. The daily average of production in 1921 was 14,119,313 gal., with a total production for the year of 5,153,549,318 gal. The total production during 1920 amounted to 4,882,546,649 gal. Exports and shipments for 1921 amounted to a daily average of 1,511,000 gal., or 283,000 gal. less than the daily average of exports and shipments for 1920.

On Jan. 1, 1922, there were 303 refineries, with a total daily indicated capacity of 1,736,725 barrels operating in the United States as compared with 328 operating plants having a daily indicated capacity of 1,714,395 barrels on Jan. 1, 1921. These plants were operating on a basis of 80 per cent of their indicated capacity on Jan. 1, 1922, and 84 per cent on Jan. 1, 1921.

During the year 1921 the petroleum refineries of the United States ran 75,325,670 barrels of Mexican crude oil; 2,745,015 barrels of Mexican tops and 160,557 barrels of Mexican crude naphtha through the stills. The Mexican crude run exceeded 1920 by 19 per cent.

France Still Seeks Own "National Fuel"

Government's Present Substitute for Foreign Gasoline Not Proving Satisfactory

PARIS, Feb. 28 (*by mail*)—With cash prizes of $50,000 for an alcohol fuel competition, and a Government subvention of $80,000 for laboratory experiments, France is making a serious effort to produce national substitutes for foreign gasoline. There is on the market at the present time a Government mixture known as "national fuel" which is composed of 50 per cent German benzol and 50 per cent French alcohol. This is used by the Paris omnibus company with not altogether satisfactory results and has met with hardly any success elsewhere.

An important competition is about to open at Beziers, in the south of France, with direct government support, with a view to the development of a national fuel on an alcohol basis. The program provides for bench tests of different classes of fuels presented by the competitors.

Says Program Is Impossible

It is impossible for the present French program to solve the gasoline problem of France, declares Maurice Goudard, president of the Solex Carbureter Co. Goudard indicated that the efforts to enforce the use of alcohol is only an attempt of the farmers and wine growers of France to put an additional tax on automobile users. If it is made compulsory for automobiles to use alcohol fuel, this will open up a rich market for the beetroot growers of the north and will leave the southern-produced alcohol free for marketing, without competition, for human consumption.

French national fuel is very international, says Goudard, for only the alcohol is produced in France, the benzol or gasoline mixed with it having to be imported from abroad. In case of war the whole of the French production of alcohol would be taken over for making explosives and the bottom would drop out of the national fuel program.

The French automobile industry is being crippled by the high price of gasoline, which costs five times more than in pre-war days, despite improved and more economical methods of handling. The average increase in the cost of commodities in France is three times the pre-war standard, while in the case of automobiles the coefficient is less than 3. Goudard considers that the final solution of the problem will be found in synthetic alcohol and benzol.

ANOTHER ROAD SCHOLARSHIP

WASHINGTON, March 7—For the third consecutive year a four year university scholarship is being offered high school students by the Highway and Highway Transport Education Committee. The scholarship, which is being given by Harvey S. Firestone for the best essay written on the subject, "How Good Roads Are Developing My Community," is an award to encourage the study of highway economics. The essays must not exceed 700 words in length; they must be submitted not later than May 1, and all students of high school grade are eligible to compete.

Eastern Ford Dealers Are Guests of Company

NEW YORK, March 8—More than 500 Ford dealers from the Metropolitan district, New England and New York state were guests of the Ford company at luncheon at the Commodore Hotel yesterday. Several factory representatives were present, including W. A. Ryan, general sales manager; Frank Haddis and E. B. Hobart, superintendent of the parts department of the factory. They were the principal speakers.

Ryan referred briefly to the Lincoln car, saying that 15 a day now were being turned out, but that production soon would be increased to 35. He added that Henry Ford expected large sales for the Fordson tractor at the new price.

Output in February Gains Over January

(*Continued from page* 582)

Rapid improvement in sentiment is apparent in the agricultural districts, and the rising prices of farm products give every reason for confidence that farmers will be back in the market for automotive products in the near future. A questionnaire sent recently to representative farmers in the states of Washington, Idaho and Oregon brought the information that many of them intended this year to buy not only trucks but passenger cars. The farm market for light delivery vehicles is steadily improving. Export sales also are expanding.

Substantial sales of the more popular lines are being made in almost all parts of the country, and it now is certain that the first quarter will show a very large increase in business in comparison with the same period last year. It is not probable, however, that the second quarter will show so large a comparative gain because sales in those months of 1921 were surprisingly good.

While predictions are dangerous in a period of readjustment, it can be stated with reasonable confidence that passenger car sales this year will be fully as good as last, when they aggregated 1,500,000; truck sales will be considerably larger and the parts business very much better.

Conservatism Marks Outlook in New York

Metropolitan Distributors Regard Present Demands for Cars Typical of Season

NEW YORK, March 9—Metropolitan car distributors are approaching mid-March with an encouraging record of sales for the early part of the year and prospects of lively business up until about the end of June. The more experienced and farsighted merchants, however, are not letting present and immediate prospect business, even with its substantial increase over that of a year ago, lead them into anticipation of a heavy volume of sales for 1922. They see in the present condition of the market nothing more than the typical spring demand of a year that is expected to approach a little way toward what might be termed normal in comparison with the restricted business of 1921.

Distributors and dealers who can be induced to talk without putting "publicity" into their conversations do not predict that the present stimulation will go right on throughout the year. They frankly look for a quiet and, on some lines, even dull third quarter, and for a fourth quarter whose volume will be determined by the size and value of the 1922 crops and the reactions of the industrial and commercial centers to the harvest situation. Studebaker, Buick and Dodge are selling heavily, and good records are being made in a number of other lines, including Cadillac, Chevrolet, Overland and Ford.

The wholesale territory around New York is reflecting the metropolitan situation, and the general result, of course, is the placing of pretty sizeable orders with the factories. These are virtually for immediate delivery, as the veteran distributors see the need for sizeable stocks in order that they may lot lose out on the demand which will exist during the next three months.

There is nothing in the New York situation, however, to indicate that any tremendous improvement over the sales records of 1921 can be expected. A thoughtful analysis of the situation suggests that in this territory the increase in business will be only a logical one, based on the absolute necessity for some replacements postponed a year ago and on the plainly apparent better feeling of the public regarding the future of business.

ASK URSUS RECEIVER

CHICAGO, March 6—Stockholders of the Ursus Motors Co., incorporated at $1,000,000, have filed a suit for a receiver in the Circuit Court. The bill alleges that 4000 stockholders have been fraudulently deprived of approximately a million dollars. According to the bill, the company was formed to manufacture tractors and farm implements, and the money received has not been used for manufacturing purposes.

Adria Pays in Full; Factory Will Resume

Creditors Gave Consent to Extension on Payments at Meeting a Month Ago

BUFFALO, March 4—The Adria Motor Car Co. of Batavia has issued an announcement through President Vremasak that it has paid its creditors in full and is now ready to resume its manufacturing operations suspended more than a month ago, when the company faced a cash shortage.

Extension on payments of accounts was given the company by its creditors when a general meeting of the stockholders and directors was held a month ago. At that time it was stated that payment in full would be made just as quickly as a refinancing plan could be worked out. The plan has now been carried through successfully, according to the company officers, and the corporation is prepared to meet its fullest business demands.

Vremasak said that from September to November the company manufactured 15 cars and that 17 others were in process of manufacture when the factory was closed.

"Now we are prepared to go ahead fast again," he said. "One of our distributors has 15 dealers and has orders in writing for more than 500 cars. The company is about to build a new model, which we believe will be popular."

International Metal Acquired by Ternstedt

DETROIT, March 9—The Ternstedt Manufacturing Co. has acquired the International Metal Stamping Co. of this city, which occupies a modern factory building with a floor space of 110,000 sq. ft. especially constructed for the carrying of heavy equipment. All the assets have been taken over by the Ternstedt company, including plant, equipment and real estate.

The International Metal Stamping Co. has manufactured successfully automobile stampings, fenders and kindred parts. The Ternstedt company now has a total floor space of 500,000 sq. ft. devoted to the manufacture of automobile body hardware. It has operated on a full time basis during the entire period of depression.

Car Demand Continues in Southern California

LOS ANGELES, March 4—According to a recapitulation of the registration in Southern California of new motor cars and trucks for January, there is no appreciable falling off in the demand. This is the period of registration for all cars in the state, and because of congestion in the motor vehicle department new car reports have been held up. Local distributors are very much encouraged by the records. A total of 4049 new cars of all makes and 369 commercial vehicles was registered.

The report shows that the nine other counties in this part of the state registered only 26 per cent of the total, the remainder being made up in Los Angeles county. There were 1472 Ford passenger cars and 186 trucks listed. Chevrolet was second, with Buick leading the field in cars of a higher price. Among the solid-tired trucks, Mack predominated 2 to 1.

In January 1921, a total of 2003 passenger cars of all makes was registered. January 1922 more than doubled this figure. Since the first of the year business has shown an upward trend, and despite the shorter period, February probably will show a gain over January. During the 30 days ending Feb. 20, there were 64 new Chandler cars sold and delivered in the city of Los Angeles, a new record for any 30 day period.

Plate Recommendations Adopted by Truck Makers

NEW YORK, March 4—At the general meeting of the truck members of the National Automobile Chamber of Commerce it was unanimously voted to adopt the recommendations of the Truck standards Committee as follows:

That the standard caution plate adopted by the Chamber in 1912 is more suitable for present requirements than any other form of plate.

That a more general use of this plate should be made and that the space provided for weights should be actually filled in.

That the manufacturer should recommend to the State Motor Vehicle Commissioner that no license be issued for a motor vehicle unless weights are properly filled in on plate at time of application.

Roses, Cake and Statue Given Leland on Birthday

DETROIT, March 3—A miniature replica in bronze of the St. Gauden's Lincoln, standing about three feet in height, was presented to Henry M. Leland on his seventy-ninth birthday in February by the ten original Lincoln distributors. The occasion of the presentation was made one of general participation by all employees and dealers, the former contributing a huge cake to the ceremonies and the latter a bouquet of seventy-nine American beauty roses. There was a general reception, in which speeches were made by Henry M. Leland and other officers. Henry and Edsel Ford attended.

LINCOLN TIME EXTENDED

DETROIT, March 6—An extension of time in which creditors of the Lincoln Motor Co. might file claims is announced by the Detroit Trust Co., receiver. The extension from March 1 to April 1 was made, it was explained, to permit the government to file a claim of the War Department, growing out of war materials contracts, and said to amount to approximately $6,000,000. Other creditors are to benefit by the extension.

Suggests Bank Aid for Roads in China

Shanghai Editor Sees All Countries Lending Help in Highway Upbuilding

LOS ANGELES, March 4—If American, British, French, German, Japanese, Norwegian and other capital can co-operate harmoniously and profitably with the Chinese in the conduct of banking in China, it would seem that these institutions might assist in providing the much needed capital required for the construction of new roads and expanding the automobile trade in China, says the *Far Eastern Review* (Shanghai) in its special automotive number recently issued.

The field is declared to be wide and important enough for the creation of a special sino-foreign bank.

"That China offers one of the greatest fields for the expansion of motor traffic is being emphasized by the widespread demand for good roads, the organization of companies for their construction and the orders that have been placed for motor vehicles," says the leading editorial in the special issue. It proceeds to state:

Unusual Road Activity

A review of the market discloses an unusual activity in all sections of the vast country in opening up new communications for commercial and military purposes. While it is too early to say that road building in China has been taken up in that serious frame of mind that impels other peoples to gridiron their lands with arteries of communication, it may be said that a good beginning has been made, and, if funds can be found for continuous construction and maintenance, the future holds bright for the development of a huge market for motor vehicles of all kinds.

This phase of China's development can be traced largely to the fact that for eight years railway construction has been practically at a standstill, with very little hope that funds on a large scale will be forthcoming from abroad for the resumption of work. Cities and towns in the interior, which cannot hope to be connected by rail, are turning their attention to the cheaper method of road communication, which calls for little more than the use of the over-abundant local labor in grading, rolling and, in some cases, of breaking stone.

These encouraging signs are also traceable to the excellent campaign being carried on by the good roads movement in the interior. Could capital be more readily obtained for road-making purposes, a boom in the automobile trade would follow. Unfortunately, there is little security for foreign capital in such enterprises, other than that supplied by the central or provincial governments, and such advances would have to come under the scope of the consortium.

NEW NAME FOR MACK MAKERS

NEW YORK, March 9—The International Motor Truck Co. has called a special meeting of its stockholders for March 22 to vote on changing the name of the company to Mack Trucks, Inc. The annual meeting will be held the same day.

MEN OF THE INDUSTRY

William A. Henderson, until a short time ago connected with the Dort Motor Car Co. in the capacity of manager of its body plant at Kalamazoo, has become president and general manager of the Brooks-Ostruk Co., New York City. Henderson was associated with the Holbrook Co. of New York for more than seven years as factory manager and had entire charge of the designing, constructing and manufacturing ends of the business.

H. C. Smith, who has resigned from engineering work in the aviation department of the government with which he has been associated for the last four years, has been appointed district sales supervisor for Earl Motors, Inc., with headquarters at Evansville, Ind. He has had considerable automobile experience in both retail and wholesale work. His territory includes sections of Indiana, Illinois and Kentucky.

Harmon F. Fisher has been appointed as engineer, connected with Research Division, of the American Petroleum Institute. Fisher has been a consulting engineer and was previously engineer in charge of operation of the U. S. Government helium plant at Petrolia, Tex. At various times he has been connected with the Gellert Engineering Co., Research Corp., and Westinghouse Electric Manufacturing Co.

E. E. Peake, for the last ten years secretary and treasurer of the Kansas City Motor Car Dealers Association, has resigned. He was one of the organizers of the National Automobile Dealers Association and until his resignation in February had been president since its organization of the National Association of Automobile Show and Association Managers.

H. R. Hyman has been appointed advertising counsel for the Stutz Motor Car Co. of America. Hyman has had an extended experience in the handling of automotive advertising. For more than seven years he was identified with the Cole Motor Car Co.

Perry McGregor has been named superintendent of the Oakland Motor Car Co. engine plant, succeeding Emmet L. Page, resigned. He has been superintendent of the Saginaw Products Co. motor plant and held a similar position with Chevrolet for several years.

R. G. Craig has been named manager of the New York branch of the Dort Motor Car Co., succeeding F. L. Sanford, who resigned to join the Dodge Brothers field organization. Craig was formerly Dort manager of sales at the New York branch.

S. M. MacDonald and **A. L. Haskell,** manager and assistant manager, respectively, of the Boston office of the New York Lubricating Oil Co., have assumed active representation of the National Lubricants Co. in New England.

H. Stuart Hotchkiss, now president of the General Rubber Co. and the United States Rubber Plantations, Inc., has been chosen vice-president of the parent company in charge of all overseas activities.

Francis W. Davis has tendered his resignation as consulting engineer of the Pierce-Arrow Motor Car Co. to take effect April 1. He will probably engage in consulting work in the fall.

Edward H. Hart, formerly general counsel of the Federal Reserve Bank of New York, has been elected vice-president in charge of legal matters of the United States Rubber Co.

A. C. Galbraith, formerly with the Mason Tire & Rubber Co., is New York City representative for the Republic Rubber Co.

W. G. Kimball, vice-president of the Columbia Trust Co., New York, has been elected a director of the Pierce-Arrow Motor Car Co.

H. C. Bowen has resigned as advertising manager for the Rauch & Lang Co., Chicopee Falls, Mass.

American Truck Finishes Run in Argentina Test

WASHINGTON, March 9—Agents of American firms in Argentina anticipate that the results of the recent truck tests will have a salutary effect upon the sales in that country. The official tests for speed and economy when loaded to capacity and operated over dirt roads, as conducted by the Argentine Army, showed that the one American entered in the competitive race finished the entire course in a very satisfactory manner, running from Buenos Aires to San Francisco; from there over a dirt road to the National Encampment at the Campo de Mayo, and after various tests at the Army Camp, returning to Buenos Aires via Moron.

The three other trucks competing (Krupp, Mercedes and Opel) of German manufacture, were forced to abandon the test before reaching Campo de Mayo.

MAY BUY CHRYSLER RIGHTS

TOLEDO, March 7—Frank Kennison, one of the receivers for the Willys Corp., has been informed that Clement Studebaker, Jr., Rollin H. White, president of the Cleveland Tractor Co., and Fred Zeder, former chief engineer of the Studebaker Corp., who designed the Chrysler six, are working out a plan to finance the purchase from the Willys Corp. the rights to manufacture the Chrysler six and have taken some preliminary steps in this direction. It is reported that if they are successful in their efforts the car will be produced at the plant of the tractor company.

COMMITTEE FOR JACKSON SHAFT

CHICAGO, March 4—A committee representing the holders of the $100,000 7 per cent notes of the Jackson Motor Shaft Co., bearing a March 1 maturity date, has been formed. The stock of this company is owned by Earl Motors. As soon as the notes are deposited with the Chicago Trust Co., the bank will pay the interest and make arrangements for extensions. The company is considered by bankers to be solvent, but its affairs are entangled with Earl Motors. Both situations are expected to be cleared up in the near future.

SPEEDWAY FOR KANSAS CITY

KANSAS CITY, March 6—This city is to have one of the big motor car speedways of the country. The track and grandstand and other buildings will be constructed on land on which an option has been obtained, several miles east of the city. The Kansas City Speedway Association, which is promoting the undertaking, is headed by John A. Butler, with E. E. Peake, former secretary of the Kansas City Motor Car Dealers Association, as secretary and manager.

Ash Demand Growing Southern Mills Show

Orders Received from Automotive Industry Fill Books for Some Weeks Ahead

ATLANTA, March 9—Evidence of the steady improvement being noted in automobile manufacturing throughout the country is shown in the increased demand for ash at the southeastern lumber mills, orders from this source having now reached a point where a majority of the mills cutting ash have ample business booked for some weeks ahead. This demand has been unusually active for the past month and has been increasing steadily every week, with present indications portending still further improvement during March.

Ash prices have remained comparatively firm since the first of the year, but millmen generally are expecting increases within the next few weeks if orders continue to be booked in the present volume from the automobile trade. Due to the tendency on the part of some of the smaller mills to accept orders at below the market that they might obtain a quick turnover of their stock, prices are rather inclined to be bullish. However, this is not seriously affecting the situation.

Present prices for ash, tough white cane, band sawn stock, f.o.b. at the mills, only the principal items being included, are quoted as follows by the larger dealers: 4-4 ones and twos, $80; 4-4 No. 1 common and selects, $36; 4-4 No. 2 common, $18; 4-4 No. 3 common, $10; 8-4 ones and twos, $85; 8-4 No. 1 common and selects, $42; 8-4 No. 2 common, $20.

Tokio Buys Truck Fleet for Disposal of Sewage

TOKIO, Feb. 10 (*by mail*)—The City of Tokio has purchased a fleet of 47 trucks to be used for the disposal of sewage. Of these, 35 are one-ton Fords, pneumatic-tired, which will be fitted with covered rack bodies of Japanese construction. The remaining 12 are Packards, Model EC, complete with electric starting and lighting equipment and solid tires. Eight of the Packards will have Japanese-made vertical hoists and steel dump bodies, and the remainder will be fitted with ordinary platform and stake bodies.

These trucks will be used to convey the night-soil from the residential districts to the outskirts of the city, where it is sold to the farmers. Tokio, like all Oriental cities, has no regular sewer system, and the use of motor transportation for the disposal of sewage has long been advocated by local motor dealers. If other Japanese cities follow Tokio's lead in this matter, a new and large market for motor trucks will be opened. The night-soil has been previously transported by hand cars pulled by coolies.

FINANCIAL NOTES

Fisk Rubber Co. for the year ended Dec. 31, 1921 shows net profit after depreciation and rebates but before interest charges, of $3,336,467. After interest charges there remained a surplus of $2,011,379. A charge of $8,390,455 was made against profit and loss account. Surplus after payment of preferred dividends was $1,494,464. After inventory adjustments and reserve for commitments there was a surplus of $1,873,417, compared with $7,789,085 on Dec. 31, 1920. The balance sheet as of Dec. 31 last showed cash, $2,079,124; accounts receivable, $8,718,714; notes receivable, $824,871; deferred charges, $1,419,425 and inventories, $13,160,207. Accounts payable totaled $1,274,588; notes payable, $4,845,000 and depreciation reserve, $4,103,570.

Replacement Parts Co., Kansas City, adjudicated bankrupt in Federal court in that city Feb. 11, has filed its schedules, showing $64,714 secured claims and $58,099 unsecured. The secured claims consist of two notes for $25,000 and interest of $1,833 due Myrtle B. Stillwell and Ada Bambach given for cash, and note secured by deed of trust for $32,500 due Marien E. Pixley with interest of $2,464. The petition against the company was filed July 16, 1921, and delay in adjudication was due to the controversy springing out of circuit court litigation.

H. H. Franklin Manufacturing Co. for the first time is making a public offering of common stock independent of the preferred stock as part of its plans for financing its new four-cylinder model. An investor has the privilege of purchasing either preferred or common shares or both. Ninety per cent of the 285,000 shares of Franklin common stock at present outstanding is owned by officers, directors and heads of departments in the Franklin industry. The common stock, which is without par value, is offered at $50 a share.

Wire Wheel Corp. shows net loss deducted from surplus for last year's activities of $433,620. Included in this amount is operating loss of $90,588, adjustment of the inventories to present market values and writing off the usual patent depreciation. The balance sheet as of Dec. 31, last, shows cash amounting to $183,759; notes receivable $115,337; accounts receivable, $73,872; inventories, $915,557; accounts payable, $26,909; accrued taxes, etc., $23,379, and surplus, $1,130,065.

Lee Rubber & Tire Corp. for 1921 reports net profits of $9,328 after all charges and inventory adjustments, equivalent to 6 cents a share earned on its 150,000 shares of no par common stock. This is contrasted with net profits of $326,638 after charges and Federal taxes, or $2.11 a share, earned in 1920. The company's net sales aggregated $7,358,436, against $6,705,930 in 1920. Its deficit after dividends was $290,762 for 1921, as compared with a surplus of $101,638 a year before.

Firestone Tire & Rubber Co. has declared a regular quarterly dividend of 1½ per cent on the 6 per cent preferred stock and 1¾ per cent on the 7 per cent preferred. A dividend on the 6 per cent preferred is payable April 15 to stock of record April 1, and on 7 per cent preferred May 15 to stock of record May 1.

Chandler Motor Car Co. has declared the regular quarterly dividend of $1.50 a share on the capital stock, payable April 1 to stock of record March 20. The dividend is being paid out of current earnings. During the last two quarters the dividend was paid out of surplus, because of the depression in the industry.

Atlas Drop Forge Co., Lansing, paid a 50 per cent stock dividend and a 25 per cent cash dividend in February, the dividend being in reality the distribution of a surplus which has been accumulating over a period of eight to ten years.

International Motor Truck Co. has declared regular quarterly dividends of $1.75 a share on both first and second preferred stocks, payable April 1 to stock of record March 21.

Kelly-Springfield Tire Co. has declared a regular quarterly dividend of $1.50 a share on the 6 per cent preferred stock, payable April 1 to stock of record March 20.

Packard Motor Car Co. has declared a regular quarterly dividend of 1¾ per cent on the preferred stock, payable March 15 to stock of record March 1.

Sends Out Questionnaire on Trade Body Activities

WASHINGTON, March 4—Correspondence between Secretary of Commerce Hoover and Attorney-General Daugherty regarding the legal status of trade associations has brought so pointedly to the front the necessity of a complete understanding of the functions, methods and accomplishments of national trade organizations that this subject is to be made an important feature of the convention of the National Association of Manufacturers to be held in New York City, May 8, 9 and 10.

The association has sent out a questionnaire to its members in order to develop an elaborate study of the work of trade associations. The questionnaire, among other things, asks as to the type and percentage of industries represented, the character of the membership of associations, whether composed of individuals, firms or corporations, etc., and purposes, scope and authority of the departments of the organizations. This data will afford an opportunity for the compilation of a volume of authentic information regarding the work of trade bodies.

TRANSPORT RE-ELECTS OFFICERS

MT. PLEASANT, MICH., March 6—Officers of the Transport Truck Co. were re-elected at the annual meeting of the corporation. M. A. Holmes continues as president and general manager, with H. E. Chatterton as vice-president and assistant general manager. A. E. Gorham is secretary and treasurer.

MUST USE AFFIX TO HUDSON

NEW YORK, March 6—The statement that Judge Learned Hand had granted the Hudson Tire Co., Inc., of Newark, N. J., a permanent injunction restraining the Hudson Tire & Rubber Corp. of Yonkers from using the word "Hudson" on its tires, was somewhat misleading. The court order permanently enjoins the Yonkers company from the use of the word "Hudson" without "some distinguishing affix thereto." In all other respects the temporary injunction against the Hudson Tire & Rubber Corp. was vacated.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

During the past week call loans ranged from 4 per cent to 5½ per cent, as compared with 4 per cent to 6 per cent in the previous week. For fixed date funds also, the undertone was easier and offerings were more plentiful. Quotations ranged from 4¾ per cent to 5 per cent for all maturities from sixty days to six months. The prime commercial rate remained unchanged at 4¾ per cent to 5 per cent.

The Federal Reserve statement as of March 1, 1922, showed a decrease of $48,000, the net result of an increase of $4,599,000 in gold reserves and a decrease of $4,647,000 in other legal reserves. Total bills on hand declined $570,000, while total earning assets showed an increase of $57,371,000. Total deposits increased $46,261,000. Federal Reserve notes in circulation declined $1,070,000, and the reserve ratio declined from 78.1 per cent to 76.7 per cent.

The total reserves of the New York institution decreased last week $22,247,000. Total bills on hand declined $1,622,000. Total earning assets increased $35,684,000 and total deposits $24,439,000. Federal Reserve notes in circulation increased $129,000, while the ratio of total reserves to deposit and Federal Reserve note liabilities combined decreased from 87.1 per cent to 84.1 per cent.

On March 3 an issue of 7 per cent 5-Year Gold Notes of the Argentine Republic to the amount of $27,000,000 was brought out in this market.

Last week Bradstreet's Food Index number, based on wholesale prices per pound of thirty-one articles used for food, showed a gain of 1.9 per cent over the previous week, but a loss of three-tenths of 1 per cent from the corresponding week of the previous year.

The Swiss National Bank reduced its discount rate last week to 3½ per cent from the 4 per cent rate that has been in effect since August 11 last.

FORD MAY CLOSE CORK PLANT

DETROIT, March 6—Henry Ford is considering the advisability of closing his plant in Cork, Ireland, because of an attempt by the municipal authorities to coerce him into employing 2000 men instead of 1000. The Cork Corp. has decreed that the Ford company must comply at once with an alleged condition of the factory lease by employing a minimum of 2000 workmen for five years.

EXPORT TRUCK SALES GAIN

NEW YORK, March 7—Truck sales in the export field are increasing because of the strength of foreign exchage, according to M. L. Pulcher, general manager of the Federal Motor Truck Co. As typical of the way in which foreign orders are coming in, he cited one from India for thirty trucks.

INDUSTRIAL NOTES

Wharton Motors Co., Pittsburgh, states that it expects to start production at its new plant in Dallas some time this year. The company has an option for a factory site in Johnstown, Pa., where it will build a three or four-story building for the manufacture of passenger cars and trucks. Robert H. Campbell, who was former president of the Campbell Engineering Co., Chicago, and who has been associated with a number of manufacturers in the industry, has become associated as vice-president and chief engineer of the Wharton company. Thomas P. Wharton is president; E. W. Fluke, second vice-president, and L. D. Heckman, secretary and treasurer.

Grand Rapids Tire & Rubber Corp. reelected L. A. Brown, C. G. Dyer, C. S. Dickey, H. H. Swan and M. J. Goldner directors at the third annual meeting, which was attended by three hundred stockholders. The officers remain as in the past. President Brown reported the progress made in distribution and outlined plans for expansion. Treasurer Dickey stated the company was in excellent condition financially with nothing owing but current bills and with a comfortable surplus in the treasury.

Auto Body Co., Lansing, has elected John W. Haarer, cashier of the City National Bank, secretary, to succeed Fred C. Ruch. J. Edward Roe continues as president. Harris E. Thomas is vice-president and W. V. C. Jackson vice-president and general manager. Ruch continues as a director. Other directors in addition to the officers are E. S. Porter, A. C. Stebbins, C. E. Bement and Richard Price.

Hendee Manufacturing Co. has made effective a wage reduction averaging 15 per cent. This applies to the entire factory force of 600, but varies according to the kind of work done. There has been no pay cut for the office force. A survey of wage conditions in other establishments preceded the readjustment. The plant continues to operate full time.

A. & D. R. Black, consulting aeronautical engineers of New York and Washington, D. C., have closed their office in the former city, due to the slow development of civil aviation, upon which their work was partly dependent. They are carrying on consulting work at Garden City, N. Y.

Greenfield Tap & Die Corp., Greenfield, Mass., has compiled a comprehensive telegraph and cable code intended for overseas and domestic customers. It is a five letter code and so arranged that it can be combined with the majority of standard commercial codes.

Fedders Manufacturing Co. of Buffalo has purchased the former Lautz marble works plant in Bridgeburg, Ont., with the purpose of refitting it and manufacturing radiators there. Seventy-five men will be employed at the start, the force to be increased to 200 later.

Northern Wheel Co., Alma, Mich., directors have elected Frank W. Ruggles president. A. C. Chapman has been named vice-president and general manager; J. W. Blakley, vice-president; Orville Allen, secretary, and Charles O. Ward, treasurer.

Watkins Manufacturing Co., Ltd., of Canada will establish a central factory and distributing office in Syracuse. The company, which does rebabbitting with special machinery, will employ at least twenty-five men in the Syracuse plant.

Franklin Tractor Co. plant at Greenville, W. Va., has been disposed of at bankrupt sale to H. E. Bulock of Chicago, who paid $27,500 for the land and building and $7,000 for the chattels and other machinery.

Timken Roller Bearing Co. has begun operations in its new factory branch at Walkerville, Ont., choosing this point as a distributing point for all Canada.

Universal Tool Co., Inc., assets will be sold by the receiver March 21 at the plant at Garwood, N. J.

Spanish Rates Lowered on Automotive Imports

WASHINGTON, March 7—Confirmation of the reported decrease in the customs duties on automotive products in Spain has been received by the Bureau of Foreign and Domestic Commerce. The new rates, which decrease these duties materially and which again should open that market for American automobiles, are based on the c.i.f. value of the shipment at the Spanish port of entry.

The new duties, according to a statement transmitted from Hugh Chalmers, head of the tariff division of the Bureau, to Gordon Lee, director of the automotive division, show that American products are given a preference of from 5 to 30 per cent. The rates are as follows, the second category applying to shipments from the United States:

Automobiles	First tariff Ad Valorem	Second tariff Ad Valorem
Chassis with engine and automobiles complete value up to 20,000 pesetas	30 per cent	25 per cent
Motor trucks, motor buses	30 per cent	20 per cent
Framework (armaduras) without motors, longitudinal bearers, suspensions, transmissions, gearings, and separate parts not specified, for automobiles	40 per cent	25 per cent
Vehicle bodies, all kinds	60 per cent	30 per cent

INSURANCE COMPENSATION BILL

ALBANY, March 4—A bill which would create the New York Automobile Owners' Mutual Compensation Association, in which all owners of motor cars would have to be insured at cost, has been introduced in both houses of the legislature. The bill would provide compensation for persons injured or the families of those killed in automobile accidents.

It is contended that not more than 25 per cent of the money which automobile owners now have to pay because of accidents ever reaches the injured persons or their families because of litigation, expenses and insurance company profits.

SHALER PLANT BURNS

MILWAUKEE, March 6—The plant of the C. A. Shaler Co., manufacturing tire repair apparatus and headlight lenses at Waupun, Wis., has been destroyed by fire with an estimated loss of $300,000, which is partly covered by insurance.

METAL MARKETS

TO-MORROW'S unfilled tonnage statement of the United States Steel Corp will, in the present condition of the steel market, partake somewhat more than it would ordinarily of the character of a compass to the industry's future course. For the last two or three weeks producers generally have had their ears to the ground in an effort to determine whether the rumblings indicated a steady growth in the demand which would eventually justify an upward movement of prices or a relapse that would again defer hopes of increased spring demand.

The corporation's rate of operations underwent considerable expansion last month, and undoubtedly a large number of orders booked in February were filled in that month, thus exerting no influence at all on the unfilled tonnage at the end of the month. Whether to-morrow's report on the backlog of the corporation's orders shows a slight increase or a slight decrease its bearing on the state of the industry's needs is relative. For all that, however, its sentimental effect on the market's undertone will be in evidence. There has been no lack of effort to pave the road toward an upward price movement in the event that developments should be in the least favorable. "The head of one large steel company," a Wall Street publication said the other day, "declares the industry has definitely turned for the better and any one who buys steel at contract prices will consider himself fortunate before the close of spring."

While there is more diversification to the character of steel buying than there was a few weeks ago, the automotive industries are still the market's chief prop. The bulk of the steel bar business being placed at this time is for automotive rim section material. Improvement in the strip steel industry is solely traceable to broadened automotive demand. The relatively steady demand and market for sheets would be non-existent were it not for automotive buying.

Pig Iron.—Automotive foundries are melting more iron and there is a larger number of orders being placed. Buyers of more than hand-to-mouth tonnages seek concessions, however, and in most instances have been able to secure them so far. "For the moment, manufacturers are interested chiefly in volume," significantly remarks one of the large pig iron interests in its latest market letter, "looking to the future for prices which will allow a profit."

Steel.—Passenger motor car manufacturers have been specifying freely against the remainder of their first quarter 1922 sheet contracts and considerable business for second quarter has been placed in the last few days. Previous quotations continue to hold. Non-integrated sheet mills are showing more interest in sheet bars, which reflects the continuing demand for automotive sheets. A decidedly better demand for strip steel is noted. Alloy steel makers continue to broaden operations. Several fair-sized orders for bolts and nuts are reported to have been placed by automotive interests in the Middle West. Prices generally are fairly steady, the market, however, exhibiting an uncertain undertone.

Aluminum.—Automotive demand is reported to be on the up-trend. Following the sale of some sacrifice lots of 98 to 99 per cent virgin ingots at 16½c. the market is now on a minimum basis of 17c., with first hands asking from 18c. upward. One dealer points out that aluminum is again being used for automobile hoods in fairly large quantities.

Copper.—The outlook is for a slight recovery following the market's recent setback.

Calendar

SHOWS

April 3-16—New York, Second Annual Electric Automobile Show, Showroom of the New York Edison Co.

May 24-June 5—Barcelona, Spain, Automobile Show under Dealers' Direction.

FOREIGN SHOWS

March, 1922—Santiago, Chili, Annual Automobile Show.

March 10-July 31—Tokio, Japan, Peace Exhibition.

April 16-23—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czecho-Slovakia, Fourteenth International Automobile Exhibit.

May—Shanghai. Exhibition of Road Building Material.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

May 1-15—The Hague. Automobile Show, also Airplanes and Motorboats. Secretary, Spui 185, The Hague.

May 6-21—Scheveningen, Automobile Show.

May. 28-June 5—Prague. Motor Show. Hotel de Ville.

July 1-24—London (Olympia). Aircraft Exhibition.

Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Associcao Automobilista Brazileria.

Sept. 15-20—The Hague. Automobile Show.

Oct. 12-23—London (Olympia). International Commercial Vehicle Exhibition.

November—London (Olympia). Automobile Show.

Nov. 10-Dec. 19—Brussels. Automobile Show, Palais de la Cinquantenaire.

Nov. 29-Dec. 4—London (Olympia). Cycle and Motorcycle Show. British Cycle Motors, The Tower, Warwick Road, Coventry.

CONVENTIONS

May 8-10—New York, National Association of Manufacturers.

May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

May 16-18—Washington, D. C., Annual Meeting of the Chamber of Commerce of the United States.

June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28 - Sept. 2—Detroit, National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

Detroit, Mar. 24, April 28, May 26.

June 20-24—White Suplur Springs, W. Va., 1922 Summer meeting of Society of Automotive Engineers.

5,000 Trucks Needed by British Railways

Order Depends Upon Sanction Being Given to Legislation Now Pending

LONDON, Feb. 10 (*by mail*)—The group of British railways which is seeking legislative sanction to start an automobile road service has offered two modifications to allay the increasing organized opposition to the proposals. The companies agree not to concern themselves with passenger service and not to undertake to build motor trucks for their use. The former waiver interests bus lines particularly and the latter truck manufacturers. If the legislation is sanctioned, it will probably mean an order for 5000 motor trucks, chiefly from 1 to 3½-ton capacity.

As service will be an essential feature it would seem that truck makers would be able both to build and undertake maintenance of the trucks on a contract basis.

Ford Prices Lowered

British Fordson has been reduced in price to £120. Within a recent period it has fallen from £250 to £225, to £205 and to £190. For £250 the British farmer can buy a Fordson special power farming plant, comprising tractor, plough, cultivator, roller and mower, the price being about a third lower than was ruling less than a year ago.

MOTOR HORN FILM SHOWN

DETROIT, March 3—Harry G. Sparks, sales manager of the automotive equipment division of the Sparks-Withington Co., Jackson, spoke to 800 students of the Michigan State Auto School on "Motor Horns—How to Sell and Service Them." The Sparks-Withington film "Tooting Your Own Horn," which is a supplement to the Automotive Equipment Association "Ask 'Em to Buy" film, was run.

A motor horn assembly cut-out and a similar cut-out of a Sparton radiator, mounted for classroom work in the school, were presented to the students. Sparks, in furthering the "Ask 'Em to Buy" movement, has addressed and shown the film to more than 200 assemblies of dealers' and jobbers' salesmen.

CANADA OPPOSES MORE TAXES

MONTREAL, March 6—Concerted action in protest against heavy increases in motor vehicle fees was planned at emergency meetings of the Automobile Club of Canada and the Montreal Automobile Trade Association. The taxes on passenger cars would be increased from 70 cents per horsepower to 90 cents, and on motor trucks to $50 per ton capacity. It was pointed out at the meeting that the tax on a Ford car, for example, would be $26.70 under the new rate as compared with $8.75 in New York state. The tax on a McLaughlin would be $33.90, on a big six Studebaker $46.50, on a Cadillac $42 and on a Pierce-Arrow $66.30.

TIDEWATER CREDITORS AGREE

WASHINGTON, March 7—Creditors of the Tidewater Lines, Inc., owners and operators of a highway motor service in the District of Columbia and Maryland, have signed an agreement under which 20 per cent of the outstanding indebtedness will be paid up immediately and extending the period for the payment of the balance until Jan. 5. Meanwhile the company has several new directors and will pay on a cash basis. It is stated that this firm will purchase new equipment within a few weeks and make an effort to cut down maintenance costs.

STARTS JAPANESE SURVEY

TOKIO, Feb. 10 (*By Mail*)—William L. Irvine, special trade commissioner from the automotive section of the Department of Commerce, has already commenced an intensive survey of the local market. Irvine expects to remain in Japan for several months and will make a thorough investigation of the possibilities of Japan as a market for American automotive products. He has already met several of the leading dealers and will be offered every facility for his investigation.

Franklin Net Profit In 1921, $452,489

Annual Report for Year Shows Sales Were 81 Per Cent of 1920

SYRACUSE, N. Y., March 8—The annual report of the H. H. Franklin Manufacturing Co. shows a net profit for 1921 of $452,489, after taxes, depreciation and all reserves including a special reserve of $550,000 to reduce inventory to current market value. Sales for the year equalled 81 per cent of 1920.

The comparative income account shows net sales in 1921 of $22,543,484, against $28,585,399 in 1920; cost of sales, $22,090,995, compared to $27,888,884.

Current Assets, $9,369,420

The balance sheet shows total current assets of $9,369,420, against $10,940,752 in 1920. In the former figure the cash on hand equals $1,192,529; accounts and notes receivable, $543,795, and inventory, $7,484,630. The 1920 total includes cash, $1,748,295; accounts and notes receivable, $591,203, and inventory, $7,614,696.

The current liabilities for 1921 were $4,084,630 and for 1920, $7,368,180. The accounts and notes payable in 1921 stood $4,004,630, against $7,233,180 in 1920, and the Federal taxes, $80,000, compared to $135,000 in 1920.

EXHIBITING AT TOKIO

TOKIO, Feb. 5 (*By Mail*)—Several of the leading local dealers are preparing exhibits for the Peace Exhibition, which will open here March 10 and run until the end of July. Only a small part of the exhibition will be devoted to automotive products. Takata & Co. will exhibit an Isotta-Franchini chassis with eight-cylinder in line engine and models of the English Bean; Midzushima will show Renault enclosed cars, and Sale & Frazar, agents for Ford, Hupmobile, Franklin and White will have a large display. Other dealers have not yet announced their programs.